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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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VOL. XLII., No. 7. FRIDAY, FEBRUARY 15, 1907.

We are advised that the latest break in the bank of the Colorado river was closed at 6 p. m., February 11. The total time consumed from dumping the first rock was 15 days 2 hours. The material used aggregated 77,000 yds., mostly rock. The depth of water at the beginning of this last—and apparently successful—attempt was 34 ft. and the speed of the current was 4½ miles per hour. Further comment on this tremendous task will be found in another column.

Never before in this country have there been so many students enrolled in its schools of engineering. A recent canvass has shown that five institutions, viz., Cornell University, the Massachusetts Institute of Technology, Purdue University, the University of Illinois and the University of Michigan, each have 1,200 or more students in their engineering departments, and together they enroll in engineering more than 6,500 students. The institutions named are the leaders in the matter of attendance, ranking in the order named. While it is reported that certain institutions, especially those of the East, as for example, Princeton, Yale and Columbia, have enrolled fewer students in engineering courses than in previous years, others have largely increased their enrolment. This is especially true of the institutions of the middle and western states. The number of engineering students in one institution of high rank has doubled in five years; that of two others, in approximately seven years; that of others in ten years. Moreover, it appears that this increase is due to no sudden impulse but is the logical outgrowth of the prosperity and of the intellectual development of the country. The prospect is that the rate of increase which has occurred in the recent past will be maintained for many years to come. The report of the Bureau of Education for 1904, which is the latest available source of information concerning all of the institutions, gives the number of students in engineering courses for the whole country as 20,545. The end of the first quarter of the present century is likely to find 75,000 students in the engineering courses of American colleges. Of the number in attendance, not less than 15 per cent. will graduate each year or, approximately, 11,000 candidates for the engineering profession. Great as this number appears to be, it is not likely to drug the market. At the present time the supply is far short of the demand. The industrial world seems to have no difficulty in absorbing all who graduate, and considering the growth in the country's industries, and the constantly changing methods of manufacture, it is probable that the prospective growth of the schools of engineering will do no more than keep pace with the development of the country's industries.

The offer of $20,000,000 by C. W. Morse for President Mellen's Sound boat properties capitalized in stock and debt at much less than half that amount, and for which only $5,000,000 were offered three years ago, undoubtedly was a tribute to Mr. Mellen's judgment as organizer and operator, just as an earlier offer of the same sum for a trolley system which had cost $10,000,000 in 3½ per cent. bonds is a test of his judgment as an investor. But rejection of both offers was predestined, and it seems strange that the Sound boat proposition should have been seriously entertained. The vast investment of Mr. Mellen in electric roads is still new and tentative while very promising. But it has yet to stand the shock and strain of a reversed wave of industrial conditions. Not so what may be called the New Haven corporation's navy. It is old, tested by competition as well as by industrial stress, each of the greater lines of boats a logical outlet of the original railroad system which it joined, and the whole now greater than its original parts by virtue of centralized operation and control. For Mr. Mellen's corporation to part now either with its trolley or boat system would be as if the head of an army were to barter away his artillery and a protective fleet. There is a sense, too, in which any breaking up of what may justly be entitled the Mellen system would be a loss to economic science. There are a number of other bigger railroad combinations. But no other system so peculiarly and picturesquely blends monopoly over an intense industrial region with marine interests and with electric projects and potentialities. The final outworking of the collective whole will be a distinct contribution to the science of transportation which many of us will live to see. Meanwhile possibilities of naval warfare of Admiral Mellen versus Admiral Morse give a halo of future interest to the situation for those who recall the dramatics of the "dollar lines" of the later seventies between New York and Boston.

Surprise checking of enginemen, to be of the highest value, must show how well and faithfully they watch out for dangers and guard against them. To test the men's obedience to a rule where disobedience very likely will *not* result in damage, as is reported to

have been done on the Lake Shore last week, is what might be called discipline in the second degree. It is useful in its place, but it is not the most important thing, as regards the men, while as regards the public (when reported in the newspapers), it is distinctly harmful, for it leads people to think that the discipline is worse than it is. This same criticism applied in the case of the Chicago & North-Western surprise checking at Mayfair, some months ago, which was heralded abroad by the Chicago reporters. On most roads an extinguished light is not specifically defined in the rules as a condition requiring a full stop, and in case the engineman is able by moonlight or his headlight to see the blade and to know that it is in the "proceed" position he has an excuse for not stopping; and, under some rules, a fair defense. We are not trying to excuse enginemen for disregard of any rule, howsoever slight may be the danger involved, but merely to show that there are different kinds of misconduct as regards observance of signals, and that if a superintendent is going to make shining examples of disobedient enginemen he had better take cases concerning which there can be no well-founded differences of opinion. It is more useful, as an example, to show up one man in a million, who disregards a stop signal, than to expose a hundred who merely take a questionable way of reporting an irregularity in which no vital issue can be made clear. It does indeed take much more time, care and expense to find the one in a million; but, on the other hand, the certificate of merit thus given to the 999,999 who did not fail is correspondingly more valuable. If a superintendent is really forced to make much noise in administering "second degree" discipline he ought to find some way to elude the reporters. The most rational way to avoid unpleasant publicity in this matter is to make surprise checking of all kinds so common that the reporters will not look upon it as a sensation to be heralded. Moreover, this must appeal to the wise superintendent as the real need in the case, regardless of the newspapers. How is it that at any time on any road, a score, or a dozen or a half dozen, men commit the same error at the same place on the same day? Such a condition would seem to indicate a marked need of surprising somebody out of a rut, whatever the nature of the rule violated, whether of the first, second or third degree of importance.

The interesting paper by Mr. M. B. Wild, Statistician of the Baltimore & Ohio, in our issue of February 8, discussing the economical weight and speed of freight trains, is supplemented this week by equally interesting documents from Mr. B. A. Worthington, First Vice-President and General Manager of the Wheeling & Lake Erie and Wabash-Pittsburg Terminal, Mr. George R. Henderson, Consulting Mechanical Engineer, and Mr. J. M. Daly, Car Accountant of the Illinois Central. Mr. Wild took the standpoint that although it is open to question whether much actual delay has occurred in yards from holding cars for big trainloads, there is reason for discussion whether the big trainload is proving as profitable as its obvious economies in motive power cost lead one to suppose. Mr. Wild argued that the delays incident to securing the maximum trainload and moving it might not only offset the saving, but go so far beyond that the highest net revenue derived from a given period of service would be obtained from a 24-car train running 25 miles an hour, rather than from a 40-car train running 10 miles an hour. As against this, all three of our contributors believe that freight speeds as high as those named by Mr. Wild are not practicable. Mr. Worthington contends that the extravagant part of freight train movement under present conditions lies, not in the work on the road, but in the delays to cars at railroad terminals and on industry spurs; that the average daily mileage of car equipment is but a relatively small factor to be considered, and that in actual practice it will cost a good deal more to haul low-class freight in small and fast trains than it will in larger trains which move slower.

There is no doubt that in any such calculation a sharp division should be made between conditions on a road which characteristically handles low-grade traffic and one which has its main interest in manufactured articles and merchandise, which must of necessity move rapidly, in comparatively small trainloads. It is also doubtless true, as Mr. Worthington points out, that trains are not apt to approach the calculated speed line very closely on freight runs, so that a large margin must be left for actual variations, and any division superintendent could cite many cases where excessive and unscientific trainloading has proved a costly expedient. An engine that cannot properly handle its load delays not only its own train but an indefinite number of other trains, especially in single-track working, and in times of general traffic congestion, when the prime necessity is to keep freight moving. Indirectly, the advantage to a railroad of having a community friendly rather than hostile must certainly be taken into consideration, and we are inclined to believe, perhaps wrongly, that much of the oppressive state legislation in the Northwest could have been avoided by the single expedient of habitually running trains close to their schedule time, even at some sacrifice in operating cost.

We agree with Mr. Worthington's belief that the lost time before the car starts is a matter demanding more urgent attention than the lost time after it is under way. The old grievance of railroad managers, that their cars are locally used for warehouses by shippers, has never been more sharply accentuated than it has this winter, and amid all the discussion on the subject and all the blame which has been heaped upon the railroads for conditions that they were not, in the main, responsible for, no remedy for this evil has been brought out. Increased terminal facilities at crowded points, decentralization of through freight to avoid such points whenever it is possible, as recently suggested by Mr. Hill, and constant, unremitting watchfulness of every industry and every shipper holding back cars, are the resources which the railroad manager has to enable him to move freight on time and keep his cars on the line. Along with these things, it is surely worth while to consider most carefully whether the savings of a maximum trainloading balance cost of retarded train movement, keeping in mind that on single-track roads, constituting the bulk of our mileage, it has not been found practicable to secure an average movement substantially in excess of 15 miles per hour in the direction of "right of track" movement and 14 miles in the reverse direction, independent of the train loading. It is also true that such studies will not be likely to have a very broad application; from the very nature of the business, each road and each locality has its own conditions and its own peculiar set of problems.

A RAILROAD COMMISSION EXAMPLE.

The acute but much belated agitation in Connecticut against stock watering of electric railways has been recognized by Governor Woodruff, of that state, in a special message which is a form of document not often put forth in that commonwealth where the powers of the executive are somewhat exceptionally limited. The message is, in substance, a plea for additional powers for the state railroad commission, especially in the matter of regulating new capitalization and restricting it to actual values of the railway properties capitalized. It is, in effect, a proposition that the Massachusetts plan of capitalization should be adopted by Connecticut. If the message stopped there it would be commendable. But, unfortunately, it goes further and, on the theory of absence of powers, exculpates, at least by strong implication, the state railroad commission from responsibility for the unfortunate plight in which Connecticut finds herself. One can understand, perhaps, the position of a Governor who, seeking by new and general legislation to rectify for the future an old evil, does not wish to arouse personal antagonism in a state commission in which two members out of three are politicians and leaders of the dominant party. But such a motive hardly justifies failure to press home the real responsibility.

The situation in Connecticut, where the railroad commission itself has been urging its own lack of power over street railway capitalization, can be best illustrated by limiting the argument to a single case and a few sections of the state's railroad law. In the Connecticut statutes, Section 3,872 requires street railway companies to make annual returns sworn to by the President and Treasurer of the corporation. The form shall "substantially follow the form required by the interstate commerce commission for steam railroads . . . with such additional matters as shall render the return as complete, as to the business property and affairs of the companies, as the return required from steam railroad companies." Section 3,873 penalizes at $25 a day neglect on refusal to make such return and orders report of the penalty to the State Treasurer. The commission (Section 3,898) is given power to summon and examine under oath such witnesses as they think proper in relation to the affairs of any railroad or street railway company and recreant witnesses can be subjected to heavy penalty. Other citations of the Connecticut statutes could be made but the above are sufficient. They show clearly enough that while constructive powers of the Connecticut commission over street railway capitalization may not have been large their *preventive* power has been immense. All that was needed on the part of the commission was disposition and ini-

tiative. It is hardly too much to say, metaphorically, that if a single member of the commission had raised a finger of warning it would have blocked in the state untold millions of trolley stock watering.

The immediate target of the Connecticut movement and of the Governor's message has been the capitalization of the Connecticut Railway & Lighting Company, whose great volume of watered stock has recently become a security paying good dividends by its lease to the Consolidated Railway Company, the great holding corporation of the New York, New Haven & Hartford Railroad Company. The figures setting forth the hydraulics of the Railway & Lighting Company have been printed in these columns heretofore and need not be repeated now. It may suffice to say that out of capitalization of some $30,000,000 in stock and bonds about two-thirds represents watering of securities with construction and equipment account raised in the balance sheet to meet it. For six years —1901 to 1906 inclusive—and beginning with the year (1901) of the first return the Railroad Commission of Connecticut has accepted the company's statement without criticism or even comment upon its inflated character; and one searches the annual reports of the commission in vain for criticism of, much less protest or action against, the trolley stock watering in the state rife through many years. The statement may also be repeated here that the Connecticut Railroad Commission consists of three members, all of one political party, one of them an engineer more than 70 years old, and the two others active politicians and formerly chairmen of their party's state committee, neither of them with railroad training previous to taking office.

These are the plain statements of fact which neither the people of Connecticut, her legislature nor her Governor should blink. But the case ranges farther than Connecticut and has more than local meanings. The commission, inefficient and nerveless as it has been, simply illustrates the nature of the "political" state commissions everywhere—commissions which charged as trustees with holding the even scales of justice between the public service corporations and the people have been true to the real interests of neither. But the Connecticut case strikes still deeper in another direction. It proves not only the absurdity of the familiar plea—likely to be more familiar hereafter—of "lack of power," but the vital importance of improving the *personnel* of the state commissions. The state may invest those commissions with unlimited powers and may hedge them about with statutes that are sternly mandatory. But if ability or character are not there legislatures and corporations alike strive in vain. Indeed the weaker the commission in nerve and mental and moral calibre the more dangerous it becomes when new statutory responsibilities are heaped upon it.

A NEW GERMAN PASSENGER TARIFF.

The negotiations among the several states of the German Empire for a uniform passenger tariff, which have been pending some two years, have resulted in an agreement, and the reformed tariff will probably go into effect May 1, 1907. The basis of the new tariff is as follows:

	Class 1.	Class 2.	Class 3.	Class 4.
Pfennige, per kilometer	7.0	4.5	3.0	2.0
Equals, cents per mile	2.68	1.72	1.15	0.767

The chief obstacle to a uniform tariff was the objection of the South German states to the introduction of the fourth class, and this has not been wholly overcome; for in Bavaria and Baden no fourth class cars are contemplated; but on local trains only the fourth class rate will be charged for third class cars, the rate being known as class 3b.

With these rates there will be no reduction for round-trip tickets, and no free baggage. The above rates are for ordinary passenger trains. For express trains there will be an addition, but not as heretofore, an addition of so much per kilometer, but a fixed sum for three zones, namely:

	Kilometers.		
	1 to 75.	76 to 150.	More than 150.
Classes 1 and 2	0.50 pf.	1.00 mk.	2 mk.
Class 3	0.25 "	0.50 pf.	1 "

That is, for distances less than 47 miles, the ticket will cost 6 cents more in the third class and 12 cents more in the higher classes; 47 to 93 miles, 12 cents third and 24 cents first and second; all greater distances, 24 cents third and 48 cents in higher classes. This, it will be seen, is a substantial addition to the fare for short distances; thus, New York to Stamford second class, 54 kilometers, the fare would be 2.33 marks by passenger train and 2.83 by express; to New Rochelle, half as far, the fare is 1.16 marks by passenger train and 1.66 by express; in the first case 21 per cent., in the other 41 per cent. more for the fast train. But for great distances the charge for speed is inconsiderable: 24 cents to Philadelphia and only 48 cents for the longest distance for which tickets are issued. The purpose of this, doubtless, is to keep local travel off from long-distance express trains; but it would seem to be disadvantageous for the longer distance suburban trains, such as New York-Morristown, New York-Tarrytown, or New York-Stamford; where a whole train can be filled at either terminus, to the advantage both of carrier and passenger.

What we would call coupon tickets over two or more different lines by the new tariff will cost 0.115 cent more per mile for the first and second class and 0.077 cent more for third class than the tickets over one line; but they have the important advantage that they are good both on passenger and express trains. As comparatively few journeys as long as 300 miles can be made without such tickets, the one mark and two mark additions for express trains for all distances above 93 miles have very much fewer applications than they would have in a country like this. Suburban and holiday tickets, school and workmen's tickets are excepted from the uniform tariff, but most other commutations, such as mileage and book tickets, are prohibited.

There has been heretofore on some (perhaps all) the roads affected an allowance of 25 kilograms (55 lbs.) free baggage. By the reformed tariff all baggage taken in baggage cars will be charged at the following rates for every 25 kilograms:

Zone	Marks.	Zone	Marks.
1 to 25 km.	0.20	351 to 400 km.	2.00
26 " 50 "	0.25	401 " 450 "	2.25
51 " 100 "	0.50	451 " 500 "	2.50
101 " 150 "	0.75	501 " 600 "	3.00
151 " 200 "	1.00	601 " 700 "	3.50
201 " 250 "	1.25	701 " 800 "	4.00
251 " 300 "	1.50	More than 800 km.	5.00
301 " 350 "	1.75		

That is, for less than 16 miles, 4.8 cents for 55 lbs. or less; anything more than 55 lbs. up to 110 doubles the charge; 16 to 31 miles, 6 cents; then an addition of 4.8 cents for every 31 miles up to 310 miles; 12 cents for every 62 miles up to 500 miles, and for all distances greater than 500 miles $1.19 per 55 lbs. This makes New York to Philadelphia 18 cents for 55 lbs., 36 cents for 56 to 110 lbs., and 54 cents for the 150 lbs. free baggage allowed on American railroads. New York to Washington or Boston our allowance of free baggage would cost $1.43; Chicago to Buffalo, $3.57; but no more from Chicago to New York. These rates are likely to make the passenger think twice before he packs his trunk; which is doubtless desirable. In one country where the matter was investigated, it was found that not one passenger in seven had any baggage for the baggage car, and it is questioned whether the six should be taxed for the benefit of the one who does have baggage; that is, whether they should pay as much as though they had baggage.

In comparing with conditions here, it should be remembered that the free baggage allowance in Germany heretofore has been but 55 lbs. (where there was any), and that the German cars enable the passenger to carry into the car with him probably more than three times the amount of baggage that he could dispose of conveniently in one of our cars. At the above rates baggage may be taken up to the weight of 440 lbs. on one ticket. For weights in excess of this the rates are doubled. Applying these rates to the journey from New York to Chicago, with the allowance of 150 lbs. of baggage (165 lbs. would cost no more), we have:

	Class 3.	Class 2.	Class 1.
Fare	$10.71	$16.07	$24.99
Speed	.24	.48	.48
Baggage	3.57	3.57	3.57
Total	$14.52	$20.12	$29.04

The German second class cars are as good as our first class on most long routes. The first class can hardly be said to be better, but there is usually plenty of room in them. If we take a passenger without baggage, the charge is reduced to $10.95, $16.55 and $25.47 respectively.

Journeys of that length, however, are extremely rare in Germany; and even those of half that length are not common. From New York to Buffalo the German charges would be:

	Class 3.	Class 2.	Class 1.
Fare	$5.05	$7.58	$11.79
Speed	.24	.48	.48
Baggage	2.85	2.85	2.85
Total	$8.14	$10.91	$15.12

This is an unfavorable specimen on account of the baggage; if the distance were only five miles less the charges would be 36

cents less. New York to Boston or Washington (say 370 kilometers) we have:

	Class 3.	Class 2.	Class 1.
Fare	$2.64	$3.96	$6.16
Express	.24	.48	.48
	$2.88	$4.44	$6.64
Baggage	1.43	1.43	1.43
Total	$4.31	$5.87	$8.07

No figures are given for fourth class fares, because fourth class cars are not run on express, nor for long distances. In considering these comparisons it should be remembered that the German fares are to be good on all state railroads in the German Empire, and our figures are chiefly for the routes of heaviest travel and lowest fares in this country. Comparisons with routes in the Far West and the South would be much more unfavorable for the American lines. There is nowhere in Germany districts where population is so thin and travel so light as in many parts of this country. Further, it should be remembered that an overwhelmingly large part of the German travel is third class. Again, there is now a tax on tickets, which adds to the traveler's expense, though not to the railroad's income.

NEW PUBLICATIONS.

Railway Signal Association: Proceedings for the Year 1906. C. C. Rosenberg, Secretary, 12 Linden St., Bethlehem, Pa.

The present report makes a volume nearly an inch thick, the report itself, excluding the advertisements, filling 342 pages. The transactions here recorded were reported in the *Railroad Gazette* as they occurred. The annual meeting, which was held at Washington in October, fills over 200 pages. Among the subjects dealt with in the reports here printed are Electric locking at interlocking plants; How to remedy the effects of foreign current in track circuits; Specifications for mechanical and electric interlocking, for rubber covered wire, for illuminating oil, for signal posts and concrete foundations, and for storage batteries. The "Comprehensive Plan for a Complete System of Signaling" and the discussion thereon fill about 30 pages.

Ten-Wheel Type Locomotives.—Two pamphlets, published by the American Locomotive Co., New York. 6 x 9 in.; 24 and 33 pages; 54 and 72 illustrations.

The last two pamphlets published by the American Locomotive Company are the fifth and sixth of their series describing modern locomotives built by them. These pamphlets, which are uniform with their predecessors, are devoted respectively to ten-wheel type locomotives weighing less than 150,000 lbs. and those weighing more than 150,000 lbs. In the introduction it is stated that the ten-wheel type has been displaced by the Atlantic type for passenger traffic, which requires the tractive effort of six-coupled driving wheels and a boiler capacity that cannot be provided for on ten wheels. The ten-wheel type is also limited in the diameter of its drivers, because when this is over 73 in. a deep firebox cannot be readily used unless it is placed between the drivers. The ten-wheel type, however, has a large field in passenger service where the steam requirements are not too great; it has a greater motive power capacity in proportion to total weight than the Atlantic type. It is also most satisfactory for freight service where the trains are of moderate weight and high speed is desired. The pamphlets contain the usual photographs and full specifications of many different engines.

CONTRIBUTIONS

The Profitable Weight and Speed of Freight Trains.

Pittsburg, Pa., Feb. 8, 1907.

To the Editor of the Railroad Gazette:

Regarding Mr. Wild's contribution on the above topic in your issue of Feb. 8, it is evident from the article that Mr. Wild has the notion that the delay to freight trains in transit is responsible for a large share of the extreme car shortage that has existed during the past year on the railroads throughout the country. Let us analyze the question and see if this is a fact, and if Mr. Wild's suggestion seems practicable (which I do not admit for reasons which I will hereinafter state) let us see what effect the carrying out of the plan suggested would have toward relieving the car shortage.

I have before me the annual reports of all the principal railroads in the country, including the Baltimore & Ohio, the Buffalo, Rochester & Pittsburg, the Chesapeake & Ohio, the different companies forming the Vanderbilt Lines, the Harriman Lines and the Pennsylvania Lines East and West of Pittsburg, the Pittsburg & Lake Erie, the Toledo & Ohio Central, the Bessemer & Lake Erie, the Missouri Pacific, the Denver & Rio Grande, Great Northern and the Wabash Lines East and West of Toledo; these reports showing that the railroads mentioned are obtaining at the present time an average daily mileage from their equipment, of from about 12 miles on single track railroads hauling a preponderance of low class traffic, to as high as 38 miles per day on roads having from one to four tracks and handling a preponderance of high class traffic.

What does this mean? Does it not demonstrate to a certainty that the railroads of the country are obtaining from one to three hours service out of their car equipment during each 24 hours? Let us suppose, for example, that Mr. Wild's theory can be worked out and we can increase this mileage 50 per cent. (which I do not admit is practicable) we would still have left from 75 to 80 per cent. of the 24 hours during which the railroads were getting no use of their equipment. Would this not suggest that instead of sacrificing the additional expenditure involved in moving tonnage at higher speeds and in smaller train units in order to improve the movement during the less than 20 per cent. of the time out of each 24 hours that our cars are earning revenue and at the same time rendering service to the shippers of the country, that we should get busy on the *80 per cent.* of the time, and exert ourselves to lessen the time that loaded and empty cars are allowed to stand at railroad terminals, and the delay in "spotting" and "pulling" cars from industry spurs, at the same time making an energetic effort to induce shippers to load and unload cars more promptly.

It will be seen that the average daily mileage of car equipment is but a small factor in the consideration, and the great delay occasioned to car equipment in the 80 per cent. of the time unaccounted for would seem to suggest that the best way to relieve the car shortage is to bring about the fullest co-operation between the shippers and railroads, because there is not a road in the country that is not daily checking up its equipment, gathering up its loads as soon as they are ready and pulling out empties as soon as they can get hold of them, to put them into other traffic.

If Mr. Wild's table, showing the reduction in cars per train at varying speeds of from 10 to 35 miles per hour, may be considered as tonnage, he makes the following reductions in train-load:

	Per cent.
Between a speed of 10 and 15 miles per hour	12½
" " " 10 " 20 " "	30
" " " 10 " 25 " "	40
" " " 10 " 30 " "	50
" " " 10 " 35 " "	62

If Mr. Wild will take any of the modern resistance curves that have been made by the use of dynamometer cars to arrive at the resistance to moving loads, for example, the resistance curve of the *Engineering News* and the Schenectady Locomotive Works (which has been adopted by the Master Mechanics' Association), or the resistance curve of the Baldwin Locomotive Works, or for that matter, the curve made from dynamometer tests made by the late Arthur M. Wellington in 1878, which shows a slightly higher resistance between speeds of from 10 to 35 miles per hour than the others, he will find that the tonnage that can be drawn with each unit of available traction (traction that comes within the coefficient of adhesion) say on a four-tenths of 1 per cent. grade (which is about as favorable as we encounter on most low-grade lines) his reduction in tonnage would be:

Between	10	and	15	miles	per	hour	18	per cent.,	instead	of	12½	per cent.
"	10	"	20	"	"	"	35	"	"	"	30	"
"	10	"	25	"	"	"	52	"	"	"	40	"
"	10	"	30	"	"	"	63	"	"	"	50	"
"	10	"	35	"	"	"	75	"	"	"	62	"

Please understand, however, that a table calculated on these lines would not be practicable for two reasons:

First.—During my experience in inaugurating and checking for a period of four years a tonnage rating system on a road having approximately 9,000 miles of railroad, with 12 superintendent's divisions, with marked variations in physical characteristics, the only trains that ever approached the calculated speed line on freight runs within 12 to 15 per cent., were the test trains on which I rode and which were given special movement and were handled under the most favorable conditions.

Second.—Before such a sliding scale could be used, it would be necessary to calculate one to meet the physical characteristics of each freight division, because the factor of gradient resistance is invariable regardless of weather conditions or rolling friction, while the other elements of resistance, atmosphere, curvature and wheel friction, fluctuate according to the physical characteristics. For example, the resistance to a moving load on a four-tenths of 1 per cent. grade, according to established formula, would call for a decrease in the load of 75 per cent. as between 10 and 35 miles per hour, while on a 1 per cent. grade the decrease would be 61 per cent., under same conditions of speed, and on a 2 per cent. grade would be 64 per cent., simply because the factor of grade resistance is the same at all speeds and does not fluctuate from 20 times the per cent. of grade per ton, from which it will be clear that no uniform table could be made to apply to all the divisions of a given railroad, to say nothing of applying such a table to the different railroads of the country.

On a four-tenths of 1 per cent. grade, however, a reduction of 10 per cent. in a given load per unit of engine traction would give an increase in speed from 10 to 13 miles per hour, instead of an

increase of 50 per cent., as stated by Mr. Wild, and a reduction in load of 30 per cent. would give an increase in speed from 10 miles per hour to between 17 and 18 miles per hour, instead of doubling it, bearing in mind all the time that these are theoretical figures, and that the engines in actual practice, in daily work, will not work up closer than within 12 to 15 per cent. below the calculated performance under the very best practice.

After all, the test of our theories is to work them out in practice, and Mr. Wild's table likens itself to a rating sheet which I made nearly 20 years ago, based entirely on theoretical calculations, there being very little difference in the premises which I used and those that are to-day accepted by railroad statisticians in making such figures. While I was able to prove the accuracy of every figure which I had made, the trouble with the rating sheet was that the locomotives could not begin to pull the tonnage, and after I had made a careful study of the situation, I found that there were very many practical obstacles which I had not considered.

A few years ago we had 12 divisions of a certain large railroad make a series of tests under speed conditions varying as two to one and train-loads as one to one and three-tenths, covering a total of nearly 15,000 train miles, and the concensus of opinion was, when we had got entirely through with these tests, that it was really impracticable to load even slow trains for a speed of 10 miles per hour, as the engines could haul at a speed of from 12 to 15 miles per hour any load that they could start on a low grade line, and our tests finally developed that for divisions with low-grade physical characteristics, a speed of 12 to 15 miles per hour was the most economical load for the engine, and for heavier gradient lines from eight to ten miles per hour. As we had both high and low class traffic, our engine rating was made on the basis of both time and load.

As it has been my fortune to operate railroads handling a preponderance of high class freight moving at fast speeds and earning approximately one cent per ton per mile, and for the past two years a railroad with a preponderance of low class tonnage, the average earnings for the last fiscal year being 4.79 mills per ton per mile (or less than one-half as much as was earned on the road first mentioned) my experience teaches me that it would be suicidal for a railroad handling low class freight (quite a considerable share of it on the lines under my jurisdiction moving at two mills per ton per mile, which is barely sufficient to cover operating expenses, but the business must be handled) to cut down its train-load for the purpose of increasing the speed of trains between stations, a check of which shows that the trains are actually running 15 miles per hour while in motion (the delayed time incident to the density of traffic and because of an average of over 12 meeting points per hour during each of the 24, consuming 40 per cent. of the total time between terminals) for the reason that to move the tonnage in smaller units would mean an increase in the number of trains to be met and passed, and the slight gain that would be made through increasing the speed while in motion would be more than offset by the additional delay at meeting points, and the cost of service would be so largely increased that the business would no longer be profitable, as the margin of profit at the present time is extremely small.

From the annual reports which I have before me I have selected for practical illustration the figures for two roads for the last year for which we have the figures, but for obvious reasons (as I do not wish to make any invidious comparisons) we will call one of the roads the "Low-class Traffic Line" and the other the "High-class Traffic Line." I have selected these two roads because it so happens that there is only one mile difference in their total mileage, and the operating conditions and physical characteristics of the two roads are very much the same, running through the same country.

On the Low-class Line 70 per cent. of the tonnage comes under the heading of "Products of Mines," including anthracite and bituminous coal, coke, ore, stone, sand, etc., 20 per cent. coming under the heading of "Manufactures," including petroleum and other oils, sugar, naval stores, iron, pig and bloom, iron and steel rails, castings, machinery, cement, brick, lime, wagons, carriages, etc., etc., the remaining 10 per cent. coming under the head of products of agriculture, products of animals and products of forest, the average earnings per ton on the low-class line being slightly less than 66 cents, while on the high-class line 22 per cent. of the tonnage comes from products of agriculture, 12 per cent. from products of animals, 29 per cent. from products of manufacture, and 6½ per cent. from products of forest, with only 24 per cent. from products of mines, one-fourth of its tonnage being low-class, while practically three-fourths of the tonnage of the other line is low-class. The road moving the high-class tonnage has a large number of fast beef and perishable freight trains eastbound and an equal number of fast merchandise freight trains westbound, moving on schedules of 20 to 25 miles per hour. The density of traffic per mile of road is somewhat heavier on the low-class line.

Please understand that I am not criticizing the operations on the high-class line, because I realize that the class of tonnage being handled on the road in question justifies the higher cost of transportation, but for the purpose of this article comparative figures showing the cost of operation and freight statistics for the two roads in question are enclosed herewith.

Comparative Results of Operation.—Low Class vs. High Class Traffic Line.
(Figures taken from latest annual reports.)

	Account.	Traffic line. Low class.	Traffic line. High class.	Per cent., + (inc.), and —(dec.).
1.	Gross earnings	$7,787,091	$9,108,730	+ 16.97
2.	Operating expenses:			
	Conducting transportation	2,612,426	4,328,013	+ 65.70
	Maint. of way and structures	923,804	822,272	— 10.99
	Maint. of equipment	1,033,658	1,197,263	+ 15.83
	General expenses	224,091	135,462	— 39.55
	Total	$4,793,979	$6,493,010	+ 35.23
3.	Per cent. of operating: Expenses to earnings	61.56%	71.17%	+ 9.61
4.	Net earnings	$2,993,111	$2,625,720	— 12.27
	Freight Statistics.			
5.	Gross freight earnings	$6,507,488	$7,437,711	+ 14.29
6.	Revenue ton-miles	1,223,274,342	1,451,118,925	+ 18.64
7.	Company ton-miles	54,420,388	33,002,570	— 39.36
8.	Revenue tons carried	9,879,558	5,800,484	— 41.29
9.	Average distance haul one ton	123.8	250.2	+ 102.10
10.	Freight train miles	2,094,132	4,510,552	+ 115.40
11.	Mileage of loaded freight cars	41,646,682	90,338,692	+ 116.92
12.	Mileage of empty freight cars	20,806,638	41,949,611	+ 101.61
13.	Average tons per train-mile	610	329	— 46.07
14.	" tons per loaded car	30.68	16.42	— 46.48
15.	" empty cars per train	9.93	9.30	— 6.34
16.	" revenue per ton, cts.	65.87	128.22	+ 94.66
17.	" revenue per ton-mile, cts.	.532	.513	— 3.57
18.	" cost per ton-mile, cts.	.327	.365	+ 11.62
19.	" net ernge per tn-mi., cts.	.205	.148	— 27.80

Analysis of these figures shows that the gross earnings on the high-class traffic line were slightly less than 17 per cent. greater, while the operating expenses were 35 per cent. more. It will be noted that the expenses of conducting transportation, however, were over 65 per cent. more, incident to the high-speed trains moving the tonnage in smaller units.

While the high-class traffic line earned 17 per cent. more gross money, it earned over 12 per cent. less net money than the low-class traffic line, and it handled 41 per cent. less tons carried.

It will also be noted that the high-class traffic line was required to haul each ton over double the distance of the low-class traffic line, which produced the effect of requiring the high-class road to haul its tonnage at about 3½ per cent. lower average revenue per ton-mile than the low-class road, although the high-class traffic line received over $1.28 for each ton carried, while the low-class traffic line received slightly less than 66 cents per ton carried.

It will be noted also that the revenue train-load on the low-class traffic line was 610 tons as against 329 tons on the high-class traffic line, or 46 per cent. less train-load, and might be said to represent the two extremes of operating conditions, both of which are fully justified by the character of traffic handled.

The same ratio of decrease is noticeable in the average tons per loaded car as in the train-load, being 16.42 tons on the high-class traffic line as against 30.68 tons on the low-class traffic line, incident to the fact that it is moving merchandise more or less bulky and light weight, and refrigerator cars taking comparatively light loads, while the low-class traffic line is hauling mostly ore, stone and coal.

The ratio of operating expenses to earnings seems to favor the low-class traffic line, yet the more expensive high-speed service required on the high-class traffic line very likely justifies the higher operating ratio, as the tonnage in question is strongly competitive with four to five other through lines, and must be handled at high speed in low train units.

On the whole, notwithstanding that the two extremes of traffic and operating conditions are encountered in a comparison between these two roads, an analysis of the results on the mileage basis (which is slightly in excess of 500 miles on each road, with net earnings of over $5,000 per mile of road operated) proves conclusively to any railroad man that both of these roads are efficiently handled, and my judgment is that no uniform sliding scale providing for the reduction of engine ratings on the various roads indiscriminately, regardless of the classification of the tonnage which they are required to handle and on which the average earnings varies over 100 per cent., with operating conditions radically different (some having single-track with poor yard and terminal facilities and short passing tracks, and others having second, third and fourth tracks and ample terminal facilities, yet operating through the same country) would be at all practicable, and for the reasons herein given my judgment is that we are trying to cure an evil, which if it exists at all is only in special cases, with a remedy which, if adopted, would have but very slight effect upon the general situation of car shortage.

B. A. WORTHINGTON,
First Vice-President and General Manager, W. & L. E.

New York, Feb. 11, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have been very much interested in the communication of Mr. M. B. Wild published in your issue of February 8, on the profitable weight and speed of freight trains. This is a subject that cannot be given too much thought and attention, particularly at the present time of car shortage and the likelihood of legislation regarding

hours of train men. The old theory of the heavy train being the most economical one is very largely adhered to in spite of considerable evidence that both economy of operation and quantity of transportation call for a lighter load and a greater speed.

The heavy train cannot be discussed however intelligently without also considering the heavy locomotive, that is to say, there is a vast difference in results between a heavy train with a medium heavy locomotive and a heavy train with a *proportionately* heavy locomotive: in the first case the locomotive will be overloaded, but in the second case it will not be so necessarily, and if a heavy train and a heavy locomotive have the same relative proportions one to the other as a light train and a light locomotive, the result of speed of operation will not be different, but naturally the heavy train will be run with the greatest amount of economy.

The assumptions stated by Mr. Wild in his paragraphs labeled A and B do not seem to me to conform exactly to actual facts. To make this clear I give below the tractive force of a locomotive for different speeds in miles per hour, and below that the resistance per ton of train on a level, on a one per cent. and on a two per cent. grade. The figures for tractive force are what we could expect from a locomotive of ordinary proportions which had a tractive effort in full gear of 40,000 lbs., and the reduction corresponding to the increased speed follows the curve prepared several years ago by a committee of the Master Mechanics' Association:

Running speed, miles per hr...	10	15	20	25	30	35
Tractive force, 1,000 lbs.....	40	33	25	20	18	15
Level resistance, per ton.....	5	6	7	9	10	11
1 per cent. grade.	25	26	27	29	30	31
2 per cent. grade	45	46	47	49	50	51

It will be seen from these that the available tractive force of the locomotive decreases somewhat more rapidly at increased speeds than the allowance given in line C of Mr. Wild's table. On high grades the increase of resistance due to speed bears a much smaller proportion to the total resistance than it does on low grades; so that when we consider both together we are quite prepared for the assertion that on a one per cent. grade the same locomotive which we have above considered would take 1,430 tons at 10 miles an hour back of tender, whereas at twenty miles an hour it could only take 800 tons, and at thirty miles an hour only 400 tons back of tender, this reduction being considerably more rapid than appears in Mr. Wild's table. On a level, of course, the difference would be still more marked. But without knowing the actual conditions of grade, curvature, etc., and the size of locomotive on which he bases information, it is impossible to do more than call attention to this fact.

On line E we notice that Mr. Wild takes his train mile revenue at 10 cents per loaded car mile, and as on many roads the weight of car and lading, day in and day out, averages 33 tons, we should have a revenue of .3 cent per ton mile back of tender.

The cost of train operation per mile as given in line H does not seem to vary in exactly the same ratio that we have found by some studies which were made of various profiles, and in order to obtain some figures which would compare with those presented by Mr. Wild, I have taken the cost of operating a train over a division assumed to be 150 miles long with a summit in the middle, the grade being one per cent. up on one side, and one per cent. down on the other. The down hill portion being run uniformly at 30 miles per hour, and the up hill portion at varying speeds.

I have prepared a table which can be compared with Mr. Wild's, but using the actual expenses as estimated by considering the fuel, train crew, repairs and various charges that would actually occur on the different trips, and making the allowances for diminution of train weight with increase of speed as referred to above. The data used for this table can be found in page 180 of my recent book on Cost of Locomotive Operation:

Speed up hill, miles.....	5	10	15	20	25	30
Av. speed bet. terminals	7.2	12.5	16.7	20.0	22.7	25.0
Cost, per 1,000 ton-miles....	$0.51	$0.53	$0.56	$0.64	$0.78	$0.98
Net rev., per 1,000 ton-miles	$2.49	$2.47	$2.44	$2.36	$2.22	$2.02
Thousand ton-miles pr month	6,000	9,050	8,500	6,890	5,200	3,920
Net revenue pr engine month.	$14,940	$22,323	$20,740	$16,250	$11,544	$7,918

From this it would appear that the greatest net revenue earned per engine per month is at an average speed between terminals of 12½ miles per hour, and even at an average speed of 16.7 miles per hour the revenue is at least one-third greater than at 7.2 miles per hour. As we increase the speed the necessary reduction in train load causes a greater drop in the revenue. The method of obtaining the figure of net revenue is as follows:

From the table on page 180 of the book referred to, the cost of operation for 1,000 ton miles is given, which is the third line in the table here inserted, and this deducted from $3, the above assumed figure for revenue, gives us the net revenue found in the fourth line. The fifth line, giving the thousands of ton miles per month that one engine is capable of handling under the assumed conditions, allowing proper time for lay-overs, at terminals, etc., can be multiplied by the fourth line, so that the sixth line, being the product of the two, will represent the net revenue earned per engine month.

In Mr. Wild's article he has figured in his line P the net revenue in 5,000 hours; whereas our figures are for one month, or 720 hours. And while his maximum revenue is obtained at an average speed of 25 miles per hour, our table shows a maximum at 12½ miles per hour.

There is no intention, in producing these figures, of saying that Mr. Wild's data are incorrect, because without knowing the exact conditions existing on the line which we are studying, with the size and power of its equipment, and its physical properties and environments, it is impossible to draw any definite conclusions. Yet it is also evident that if such conditions are different, the final results will also be different, as illustrated by the table above given. There is little doubt, however, but that economy of operation and movement of traffic both require a speed greater than usually obtaining in freight service in this country. But just what combinations of speed and load will produce the best result can only be stated by working out the proper data for the conditions as they actually exist on the territory under investigation.

GEORGE R. HENDERSON.

Chicago, Feb. 10, 1907.

To the Editor of the Railroad Gazette:

With reference to the article on "The Profitable Weight and Speed of Freight Trains" appearing in the *Railroad Gazette* February 8 over the signature of Mr. M. B. Wild, I wish to take friendly issue with him on the accuracy of his basis of computation. Allow that the figures shown by Mr. Wild are correct as regards speed or reduction earnings and expenses per train-mile, and instead of basing our conclusions on theoretical computations of 5,000 hours of service—50,000 train-miles and 2,000,000 loaded car-miles—let us take actual train service conditions as we find them on 95 per cent. of the divisions of railroads throughout the country, both on single and double track. In Mr. Wild's article no reference is made to the return of the power in the direction of light traffic or light grades where the tonnage hauled on trains is not a factor, hence his conclusions if based only on the tons hauled in direction of heavy traffic must necessarily be in error, as the same expense per train-mile is incurred in both directions.

Take for example a practical, every-day condition. Suppose we have 140 loads to move from Baltimore to Philadelphia, a distance of 100 miles, that being the direction of heavy traffic, the coal and refrigerator cars moving east loaded and west empty. Assume that the same engine works the traffic both ways and hauls the cars in lots of 35, at 15 miles per hour eastbound, and 20 miles per hour westbound, and again in lots of 28, at 20 miles per hour. Then we may compute the time and expense incurred in both directions, the engines returning in both instances hauling less than their rating in empty and loaded cars, hence they make the same average speed.

Example.—A represents 15 miles per hour; B 20 miles per hour.

	Miles.	Hr.	Min.
A—140 loads in 4 trains east, 35 cars each at 15 miles pr hr.	400	26	40
A—140 cars* in 4 trains west, 35 cars each at 20 miles pr hr.	400	20	00
8	800	46	40

Distance over division 100 miles in each direction.

	Miles.	Hr.	Min.
B—140 loads in 5 trains east, 28 cars each at 20 miles pr hr.	500	25	00
B—140 cars* in 5 trains west, 28 cars each at 20 miles pr hr.	500	25	00
10	1,000	50	00

*Loaded and empty westbound.

A performs service both directions with....	8 trains.	800 miles	46 hr.	40 min.
B performs service both directions with....10	"	1,000 "	50 "	00 "
Saving by A—15 miles per hr..... 2	"	200 "	3 "	20 "

Cost per train-mile A.....	800 miles at $0.71	$568.00
Cost per train-mile B.....	1,000 miles at .66	660.00
Saving in favor of 15 miles per hour.....		$92.00

$92.00 saved on 4 trains east = $23.00 per train.
On 10 trains per day, 3,650 per annum x $23 = $83,950 saved per annum.

Ten trains in each direction per day is certainly a low estimate on a main line single-track road, consequently a saving of $83,950 per 100 miles of track is very reasonable.

As regards the profitable speed of freight trains I consider 12 to 15 miles per hour, including delays, as fast as economy or safety will permit even on level track where trains can be at all times kept under control. I must therefore assume that Mr. Wild's figures of freight trains moving at 25, 30 and 35 miles per hour, including delays, are merely to illustrate, and in making my computation I use his figures on 15 and 20 miles per hour, which are least favorable to me.

I fully agree with Mr. Wild that trains are overloaded, and that the roads so overloading trains suffer a material loss. The large engine and the large car have brought about this condition; they have also brought to the railroads a large increase in earning capacity and a decrease in the cost per ton per mile hauled, hence it is safe to assume they will remain with us, and so long as we have 50-ton capacity cars carrying 10 tons now and 55 tons at another time, it devolves on the railroad manager to adopt and put into effect an intelligent basis for loading his locomotives, viz., the equated or adjusted tonnage basis.

Locomotives have a given tractive power. Cars have a given

resistance based on the gross weight of each car. Two cars of 30 tons each have 64 tons drawbar pull, whereas one car of 60 tons has 55 tons of drawbar pull, hence it is folly to expect a locomotive to haul as many gross tons of light loaded or empty cars as it can haul of heavy loaded cars, and railroads must eventually load their engines according to the resistance of drawbar pull of each individual weight of car, otherwise it is impossible to obtain uniform speed in the movement of trains as well as uniform economy in the movement of the traffic.

It is also wrong to rate a locomotive to haul 100 per cent. of its tractive power at all times, even though it has demonstrated in test that it can do so, as the conditions of power, weather, fuel, trains to meet, density of traffic, and even the men handling the engine, have all to be considered. Consequently fair and reasonable concession must be made to the engine, not only in the rating but in loading after rating has been arrived at.

I have gone into this subject very exhaustively in the past eight years, and was convinced at the beginning of my investigations that it is useless to expect yardmen or trainmen to mathematically compute and reduce from gross tons of car and contents to tons of drawbar pull each car as added to train, even though they are supplied with charts, scales, etc., to aid them.

The result of my study of the subject is the perfection of a small adding device that discounts or adjusts and computes drawbar pull of each individual car from gross tons to tons of drawbar pull. Consequently, under this method, the resistance of all trains can be intelligently adjusted, permitting uniform speed to be made—the result that all operating officials are striving for.

J. M. DALY,
Car Accountant, Illinois Central.

The Supply Department.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have been interested in two articles that have appeared recently in the *Railroad Gazette* on the perspective of the supply department on our railroads, and I am disappointed that the question is not being taken up and discussed more generally. The question is a very live one and is being followed very closely and anxiously by the one person all over the country who is most deeply interested personally—the storekeeper. There are a few of us (for I am a storekeeper) who do really take an interest in our work and try to bring it up to its proper level of importance; a few of us who have ambitions beyond the mere routine of our duties; a few of us who would like to feel that the handling and looking after supplies is really a position of some importance, requiring more or less ability, and, therefore, possessing some dignity. I have never really seen it thus but once, and I am sorry to say that where it once was it is no longer, entirely owing to the individual who was at the head. When he resigned, because of poor health, there was apparently no one capable of carrying out his lofty ideas within reach, and they appointed as his successor a man of long experience and immense energy—and he has never developed any other qualification. The result was made apparent very early; his duties were curtailed because he was always too busy; his territory was divided; his work was never done. The superiority of his help fell off, with the resulting evils, and to-day the department is back in the same old rut. Why? It wasn't his fault—he should never have been appointed. The fault lies higher up. And I want to say that just there is where the fault usually lies.

Some day, perhaps, the managers and vice-presidents of our railroads will come to recognize the necessity of appointing good men at good salaries to these positions; will recognize the necessity of bringing the storekeeper in very close touch with the source of his supplies and at the same time keep him independent of that source; will recognize the necessity of putting him in very close touch with the consumer of his supplies and at the same time keep him independent of that consumer; will recognize the necessity of making him responsible to some one individual who will rank high—as high or higher than the purchasing agent or the superintendents of departments, high enough to be independent of them—and then trust to his judgment and the guidance of his superior.

This is the one and only way that the maximum of service may be obtained with the minimum of expense. Afford your storekeeper confidence. Let him work out his own detail in his own way—you will usually find it a good way. Don't interfere if he gives one of his assistants an increase of salary—be assured that he deserves it. Let him know that he is responsible for the economical management of his department, but don't interfere. Let him know that if a shop foreman makes a mistake the storekeeper is not going to be made a cat'spaw of. Let him know that his request for supplies is going to receive prompt and careful attention at the hands of the purchasing agent, and that he is going to get what he asks for—not something "just as good," but exactly what he asks for—and get it when he wants it. And let him know that he and he only is going to be held responsible for his mistakes. There won't be so many of them, take my word. There won't be so very much surplus or obsolete material, and the reason is obvious.

Just a short time ago our general foreman came to me and requested me to provide 12 engine couplers of a certain kind. I put two on requisition. About three weeks later he came to me very confidentially to see if I couldn't have the item canceled or reduced from 12 to two. It appears they had decided at headquarters to discontinue the use of this coupler, and he had been advised to that effect but had forgotten. Who do you suppose would have been blamed for this surplus? About four years ago our superintendent of motive power was possessed of a bright idea in the nature of an emergency coupler. He had about 50 put together of wrought-iron at considerable cost and put into stock, and I have been including them in my inventories ever since because he will not acknowledge their uselessness. These are only two of a great many like instances that speak loud in the interests of an independent storekeeper.

Under existing conditions on most of our railroads there is no one who takes any particular interest in surplus or obsolete materials, but if there was, who do you suppose would be held responsible here?

Some time ago, a good live storekeeper on a small road up north came to the conclusion after a careful study of the question that there were entirely too many different triple valves in service on the engines and tenders. He found he was ordering repair parts for seven and he could not determine that this was at all necessary, so he protested vigorously against it. The authorities in the case agreed with him that it didn't look just right, but they couldn't see how it could be remedied. Without further argument he ordered a small stock of the more up-to-date equipment, refusing to replace old equipment when beyond repair. In this way, and almost without their knowledge, he gradually worked in the newer stock, and to-day we find only three different kinds in service, and they are the best procurable. What does this mean? It means a reduction of 50 per cent. in the value of stock on hand, less labor in making repairs (fewer repairs to make), fewer skidded wheels and broken couplers, and a 100 per cent. better service all around.

The same man, within a year after his appointment, succeeded in reducing his monthly foundry bill from over $2,000 to less than $800, and kept it there.

The supply agent is the one individual to whom the storekeeper is responsible, and the one who is responsible for the storekeeper. He it is who is in close touch with the management and knows what is going on—what is going to be done and what is going to be required to do it. He is the one who sees to it that the required material is on the spot before the labor. If he hasn't got it, he gets it, and he knows what to get and when to get it. He always knows within a few hundred dollars what the value of material on hand is. He knows just where to put his hand on anything that can be made use of—surplus stock. He knows and sees to it that valuable stock is not being put in the scrap bins. He is never short of material important to any particular season because he is wise to conditions and requirements through information demanded and provides ahead. He sees to it that one roadmaster is not being pinched for the very material that another may be hoarding up against a possible requirement. He knows the material and the quality of the material that is most serviceable to the greatest number, and he sees to it that his storekeepers ask for it and get it. He sees to it that there is no unnecessary waste, and that for every air or steam hose sent out there is an old one brought in; or if not, why not. I am perfectly satisfied that a man who understands his business and is in a position to punish carelessness can effect an immense saving right here on most of our railroads.

To do all this and a great deal more your supply agent must know his railroad thoroughly. He must not be tied down by a lot of red tapeism, but be free to go and come as he wills. And he must come and go. It cannot be done thoroughly and well without going over the ground, and that frequently. He must poke into all corners, accepting no man's word for what may be there. His equipment need not be large: a comfortable office (not too comfortable), an experienced office assistant and a stenographer.

I note with much concern the appointment of an official on the Philadelphia & Reading designated Superintendent of Materials and Supplies, gazetted in your issue of January 4th. It seems unfortunate that the pioneer move in this direction should start under such immense difficulties and restrictions. I really cannot imagine such shortsightedness as would prompt any such set of rules as these set out in your article. They are ponderous and unworkable, embodying all the objectionable features possible, it would seem, and no good ones—the maximum of expense with the minimum of service. It is hardly necessary to point out defects in the laws governing this new official and his duties, but I would ask them how they hope to reconcile paragraphs 5 and 7? And the last, "Local storekeepers are to report, etc"! On whose payroll does this unfortunate person appear? On the Superintendent of Materials and Supplies? Then how can he possibly be honest to his superintendent and still obey every Tom, Dick and Harry who happens to have a little authority over a few men in the shop? As a rule these men have an exalted opinion of their supreme importance, and

each one thinks his wishes should receive first consideration. Difficulties insurmountable. Is he paid by the department he serves? Then how can the Superintendent of Materials and Supplies expect unprejudiced service and reports? Why this man's life will be a burden to him!

Time and again I have asked for and insisted on getting certain materials for shopmen, and when inquiries were made direct to them over my head they have repudiated my representations and accepted an inferior article. The storekeeper usually has to stand alone, without support from either side. He is being continually bombarded from one side for demanding so much and from the other for not having enough, and he was never known to give satisfaction to either. Give your storekeeper more independence, and put him under a capable head who ranks high enough to hold his own against the misrepresentations of superintendents and foremen and the arrogance of purchasing agents and their assistants, and be assured of better and more economical service. M.

Railroad Legislation.*

Philadelphia, Feb. 7, 1907.

To the Senate and House of Representatives of the Commonwealth of Pennsylvania:

GENTLEMEN—It is the general impression that important legislation affecting the railroads of the commonwealth is to be passed at this session of the legislature. A sense of duty to you as legislators, and to the public you represent, as well as to the railroads I represent, impels me to state facts and opinions which may aid you in discharging your legislative duties.

The more important railroads of this state were chartered more than a half century ago. They were given liberal franchises to encourage the investment of the capital required to develop the natural resources of the commonwealth. Many millions are invested in their capital stocks and securities. They have grown to be very large corporations. This growth is the measure of the development of our great commonwealth.

In the development of railroad transportation it is doubtless true that mistakes have been made. Here and there some dishonesty has been disclosed, but it is trifling compared to the magnitude of the work and the enormous sums of money received and expended. Because of careful business scrutiny, the average honesty of officers and employees is not below that of the community.

The railroads have developed their systems and increased their facilities to meet the yearly increase of traffic. The extraordinary prosperity of Pennsylvania is the best evidence of the public service the railroads have rendered—a prosperity which could not exist had it not been for the good service and reasonable rates established by the railroads. Do not overlook the fact that passenger and freight rates have been, from time to time, reduced far below the rates authorized in the charters. Neither the state nor the railroads can arbitrarily fix rates. The laws of trade are the inexorable factors in fixing rates. Railroads are perhaps more interested than any one else in developing business along their lines. Only in this way can they get traffic, and to get that traffic they must fix rates which will enable the manufacturers, merchants and producers of every kind to sell their products in the markets of the world.

There is no necessity for government regulation other than to prevent unreasonable discrimination. Government regulation, because it must be by fixed and rigid rules, can harass and annoy, but it cannot beneficially assist the varying demands of business. Heretofore the railroads of the country have been able to secure the capital required to build additional tracks, to acquire new terminals, to build new lines, to reconstruct their old lines, to obtain equipment, to reduce grades and curves, and generally to create improved facilities to reduce the cost of transportation, and thereby meet competition and reduce rates.

If you study the railroad transportation of other countries and compare it with our own, you will find that, notwithstanding the greater density of population in many European countries (which naturally should bring about lower rates), the fact is that our railroad transportation is the cheapest and best in the world.

Much of the capital invested has produced no return. It is broadly not true that the great railroad systems of Pennsylvania are overcapitalized. It is not true that their capital stock or securities have been watered. It is true that the actual value of their properties is in excess of the book valuation—I speak authoritatively for the Reading system.

When the Philadelphia & Reading Railroad Company was reorganized the stockholders and security-holders paid in in cash assessments $20,456,869. This cash, together with the first preference income mortgage bonds, second preference income mortgage bonds, third preference income mortgage bonds, common stock and the deferred income bonds (making an aggregate of $139,342,483) represent the stock and bonds surrendered and the money paid by the stockholders and security-holders, and for this they received a total of $116,031,300 in first preferred, second preferred and common stock, the amount of first preferred they received being only $7,184,950.

In addition to this no dividends had been paid since 1875, and in the reorganization many of the rentals on leased lines and the rates of interest were reduced. Since the reorganization—a period of ten years—the average dividend received from first preferrd stock has been only 2⅜ per cent. per annum; that of the second preferred stock, $1^{7}/_{20}$ per cent. per annum, and the common stock, ¾ per cent. per annum. Understand that these percentages are for the ten years; in some of the years no dividends were paid. For the past two years 4 per cent. has been paid on the total capital stock.

I am within safe bounds when I say that the actual loss to the security-holders of the Reading company of money and interest—not simply of paper securities—has been in excess of $100,000,000. Instead of "water" in our stock and securities there has been an absolute contraction of capital honestly invested in the past development of the Reading system.

It is nevertheless true that each year heavy expenditures must be made to meet public requirements from which no substantial increase of revenue is obtainable. The abolition of grade crossings, elevation of tracks, new terminals in cities at enormous cost, are examples. The public, I fear, overlook the economic feature. How can the railroads go on making these heavy expenditures, increasing their expenses by higher cost of wages,* materials and supplies and taxes and at the same time decrease passenger and freight rates? Are railroads unlike every other business venture? The power of taxation enables the state to conduct business at a loss. But business men know that no business can be conducted at a continuing loss, and that, in some way, whatever burden is placed on business by control of price, by taxation, or in any other way must either result in the burden being transferred to the consumers or in bankruptcy.

The industrial prosperity of the whole country is primarily due to the extraordinary expenditures which the railroads of the United States have been compelled to make in the past six years. Pennsylvania has profited more than any other state, because the largest industrial operations in the country are located within her territory.

The national state and municipal governments seem to be competing with one another in experimental legislation to take the management of railroads out of the hands of the owners, and the skilled men selected as their agents, and to turn it over to men selected in the ordinary methods of partisan politics, and to men, too, without special training, without personal interest in the results, and whose tenures are not dependent on their work, but on political conditions.

Does Pennsylvania propose to repeat the disasters which followed the state's attempt in the first half of the last century, to operate railroads and canals?

If by new legislation you render the transportation business of the country unprofitable, you will necessarily retard the further development of railroads, because the new capital required cannot be obtained. The timidity of capital is proverbial. Doubts and fears on the part of investors are even now plainly manifest; no one can forecast the measure of coming disasters if honest efforts are not made to dispel, instead of to increase by hostile legislation, these doubts and fears.

If, on the theory that they belong to the capitalist class and, therefore, may be despoiled, no consideration is to be given to present investors, comprising thousands of people who have invested their small and large savings in railroad securities, some thought should be given to the thousands of employees, and the many interests which will suffer when railroads are rendered powerless to go forward and, in a legitimate and progressive way, supply adequate transportation facilities for the business of the country.

The national government (apparently on the assumption that the power to regulate commerce gives a wholesale power to regulate the business of the country) has given the Interstate Commerce Commission large powers over transportation. Time and experience alone can clearly demonstrate the effect of what it may do on the transportation and general business of the country. It will simply be mischievous legislation for Pennsylvania to create a similar commission. It is not needed, and it will serve no useful purpose.

TWO CENTS PER MILE PASSENGER RATE.

We are given to understand that election promises were made which have committed the dominant party to the passage of a law limiting passenger rates to 2 cents per mile. I assume that these pre-election promises—while well enough intended—are subject to reconsideration by men who have assumed official responsibility. One of the judges of the Supreme Court years ago quaintly said that "the first judgment on earth was only pronounced after summons and hearing." The railroads have had no hearing. We are entitled to it before you act.

Let me state the case. The passenger traffic of the railroads is

*Letter of George F. Baer, President of the Philadelphia & Reading, to the Pennsylvania Legislature.

*The increase in wages paid by the Philadelphia & Reading in December, 1906, over December, 1905, was $243,954. The increase in gross receipts was only $87,736.

conducted without profit. As common carriers they are bound to carry passengers. I have had a careful examination made of the passenger business of the Philadelphia & Reading Railway with a view of determining whether it is done at a profit or loss, with the following result:

Expenses of and Income from Passenger Traffic for One Year Based on Figures for Year Ending June 30, 1906.

Repairs and maintenance of passenger equipment		$1,313,623.35
Interest on cost of passenger equipment, $4,639,948.54		278,396.91
Interest on cost of passenger stations, not including Reading terminal, $1,416,482		84,988.92
Interest on P. & R. terminal bonds	$425,000.00	
Less income from Reading terminal	156,616.00	
		268,384.00
Operating expenses		1,264,049.34
Interest on 10 per cent. of cost of Philadelphia subway, $274,000.00 3½ per cent.		9,602.25
Proportion of annual charges exclusive of dividends based on a division of gross earnings as between passenger and freight		1,242,833.97
		$7,461,878.74
Income from Passenger Traffic.		
Passenger	$6,216,316.25	
Mail	120,795.11	
Express	572,920.56	
Union News	17,500.00	
		6,927,531.92
Loss in operating		$534,346.82

It may interest you to know that, taking the month of November, the following is the division of passenger receipts based on rate per mile:

	Receipts.	Per cent.	Passengers.	Per cent.
Over 2c. per mile	$180,906.21	35	427,878	17
At 2c. per mile	113,940.45	22	254,676	10
Under 2c. per mile	225,185.79	43	1,893,261	73
Total	$520,032.45	100	2,575,815	100

The average rate of our suburban traffic is one and two-tenths of a cent per mile.

The short haul on the suburban passenger traffic of the Philadelphia & Reading Railway—the average being only a little over seven miles per passenger—largely increases the cost of operation.

The passenger business being done at a loss, the railroads will not voluntarily increase that loss, but will be compelled to increase local rates to make up the loss they will sustain by the enforcement of a maximum rate of 2 cents per mile. I have already stated that, notwithstanding the maximum rate fixed in the charters of the railroad companies, the railroads have voluntarily reduced rates to accommodate the public. The question then arises:

Has the legislature the legal power to name a rate of 2 cents per mile?

The rates named in the charters of the companies incorporated prior to 1857 (without reference to all of them) are exemplified by the rates named in the Pennsylvania Railroad Company's charter of April 13, 1846. The twenty-first section gives the company the power to fix such rates "as to the president and directors shall seem reasonable," with the proviso that "in the transportation of passengers no charge shall be made to exceed 3 cents per mile for through passengers and 3½ cents per mile for way passengers."

The General Railroad Act of February 19, 1849, Section 18, reads: "In the transportation of passengers no charge shall be made to exceed 3 cents per mile for through passengers and 3½ cents per mile for way passengers." This follows exactly the language of the Pennsylvania Railroad Company's charter. Now, where does the legislature of Pennsylvania get the power to change these charter provisions?

The charters themselves contain no provision reserving the right to alter, appeal or amend. Some of the charters contain a reservation that in case of "misuse or abuse of the privileges granted the legislature may resume all and singular the rights and privileges granted to said corporation." But, so far as it pertains to the question of passenger rates, it cannot be an abuse of power to fix a rate within the limit fixed by the legislature. Aside from that, the question of misuse and abuse is a judicial and not a legislative one.

The constitutional amendment of 1857 reserves the power to alter, revoke or annul every charter granted since that time. The effect of the amendment of 1857 was not to give power to revoke a right granted to a corporation prior to 1857. Every right granted since 1857 to old corporations is subject to legislative control. The right to fix rates for passenger transportation, within the limits hereinbefore stated, was granted to the railroads prior to 1857.

Does the constitution of 1874 change this rule? Section 10, Article 16, says:

"The general assembly shall have the power to alter, revoke or annul any charter of incorporation now existing, and revocable at the adoption of this constitution, or any that may hereafter be created, whenever, in their opinion it may be injurious to the citizens of this commonwealth, in such manner, however, that no injustice shall be done to the corporators. No law hereafter enacted shall create, renew or extend the charter of more than one corporation."

The power to alter, revoke or annul any charter of corporations then existing is limited to such charters as were revocable "at the adoption of the constitution of 1874."

Will any one say that the charters of the Pennsylvania Railroad Company, the Philadelphia & Reading Railroad Company, the Lehigh Valley, the Delaware, Lackawanna & Western, the Lehigh & Susquehanna, the Delaware & Hudson were revocable in 1874, at the time of the adoption of the constitution? Even if the legal difficulties which surround this question, and the protection which the law gives corporations, is to be considered no barrier to legislative action, on the general theory that if the law be so the courts in the end will protect us. There are further constitutional limitations to which your attention is respectfully called. One is that the thing to be altered must be injurious to the citizens, and that in removing the injury no injustice shall be done to the corporators. When we show that the transportation of passengers is already being conducted at a loss, how can you find that a greater loss may be inflicted without injury and injustice to the corporators?

If I am correct in my contention that you have not the legislative power to fix rates that will be binding on the older corporations, any act which you pass will only be obligatory on the railroads chartered since 1857. The result would be legislative discrimination against this class of corporations.

INCREASED TAXATION.

Notwithstanding the extraordinary—and some good citizens think, extravagant—sums expended in the construction of a new capitol, there is a considerable balance in the state treasury. This demonstrates that the present tax laws produce more revenue than is required for a government honestly and economically administered. Last year the Reading System (exclusive of the Reading Iron Company and the Central Railroad Company of New Jersey and its affiliated and controlled companies) paid taxes in the State of Pennsylvania to the amount of $1,684,544. The last annual report shows the surplus earnings (that is, earnings remaining after payment of interest, rentals and taxes) to have been $7,843,819. In other words, we paid 21⅝ per cent. of our total net earnings in taxes.

Safeguards on Steam Railroads.

The following paragraphs are taken from the annual report of the Massachusetts Railroad Commissioners:

In the use of the appropriation made by the Legislature of 1906, the Board has made a study at home and abroad of methods of equipping and operating railroads with a view to lessening accidents. Though accidents are not so frequent upon the railroads of England as upon those of the United States, the difference is probably less striking than has been claimed. Accurate conclusions can be reached only through a marshaling of figures with more attention to character of traffic and a more thorough study of the subject than any yet made.

At all events to be close to the scene of the catastrophe of last June on the London and Southwestern railway and to read from day to day in the English papers of accidents at one and another place upon different roads had a tendency to shake any belief that it is absolutely safe to ride upon railroads in England.

In one respect, however, the English practice is superior to our own, and that is in the uncompromising character of the laws against trespassing upon railroad premises and the rigid way in which these laws are enforced.

The public supervision of railroads in England has produced marked results in securing a roadbed and equipment in every way perfected for use before that use is permitted. This means increase in cost and delay in completion, but the end justifies both. In this state the extension of railroad lines almost wholly ceased many years ago. It is with satisfaction, however, that we can refer to the recent extension of the Needham branch of the New York, New Haven & Hartford system as one which upon inspection fulfilled every requirement in construction and equipment before it was opened to travel.

Block signals are practically in universal use upon the English railroads; on main lines the block telegraph system and on branch lines either the block telegraph and electric staff systems combined or the electric train tablet system. The driver of an engine is allowed to pass the distant signal when showing red, though he must stop when the home signal shows red. This distinction between two signals showing the same color, in our opinion, requires on the part of a driver too great familiarity with localities. A similar use of colors was held objectionable by the Board in its review of the Baker Bridge case. The rule then recommended and since adopted by the company is that red should always mean danger and call for a stopping of the train.

An examination of the signals found upon our own railroads where thorough work has been attempted, proves that there is no need of adopting foreign fashions in respect to these safeguards. Upon the Pennsylvania and the Central Railroad of New Jersey between Jersey City and Philadelphia, on the Hudson River division of the New York Central, and in places upon the railroads within this state there are block signals of the highest order of excellence.

The work before our companies is that of a complete installa-

tion of these signals upon all lines of track. The recent order of the board upon this subject reads as follows:

1. The ultimate end to be secured is the installation of some approved form of block signals upon all steam railroad lines within the state at as early a day as may be practicable. This means a substantial outlay by railroad companies in the immediate future.

2. The order in which block signals should be installed must have reference to both amount of traffic and physical conditions. Of first importance is the equipment of lines of railroad embracing two or more tracks, or presenting the conditions of a single track carrying a large amount of traffic and involving heavy grades and sharp curves. Local conditions may, of course, demand at particular places early equipment out of the usual order.

3. Companies are requested to submit to the Board on or before the 15th day of this month (December), a brief description of the block signals now in use upon their several lines within the state, together with an explanation of such action as has been taken in either actually equipping these lines or in making arrangement for their future equipment with block signals, since the first day of January, 1906.

The Board has selected no particular type of signal as the only one which it will approve and has not declared a preference in every instance for an automatic rather than a manual control, for the reason that between most approved types of either class there is no such marked superiority as would warrant such arbitrary action.

The effort to eliminate human infirmity as a contributing factor to railroad accidents has led to the invention of automatic devices intended to overcome any mistake of those in charge of the movement of trains; as, for example, the omission to notice or obey signals. While much has been accomplished in this direction that has been productive of good results, automatic safeguards of this character are as yet in an experimental stage. At the same time the great importance of lessening the number of accidents due to the failure of some human agency, ought to insure a most thorough and unprejudiced testing of all inventions which seem to have substantial merit.

FIRE EXTINGUISHING APPARATUS.

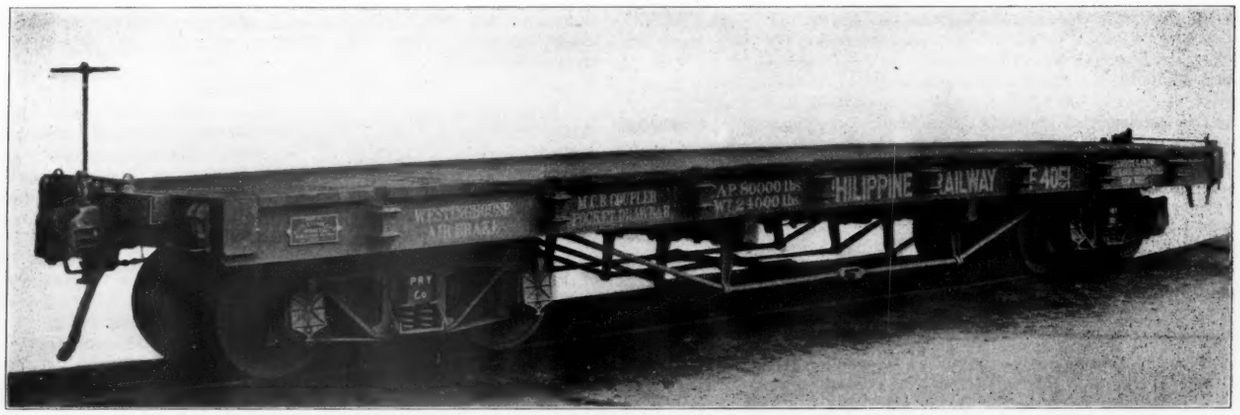
The Board is of the opinion that companies ought to provide trains with some kind of fire extinguishing apparatus. In accordance with our usual practice no particular kind has been designated, companies having been asked to present for approval on or before the first day of May, 1907, such devices for extinguishing fires as they may desire to use, the intervening time affording opportunity for further inquiry as to the merits of different inventions.

New Cars from the Middletown Car Works.

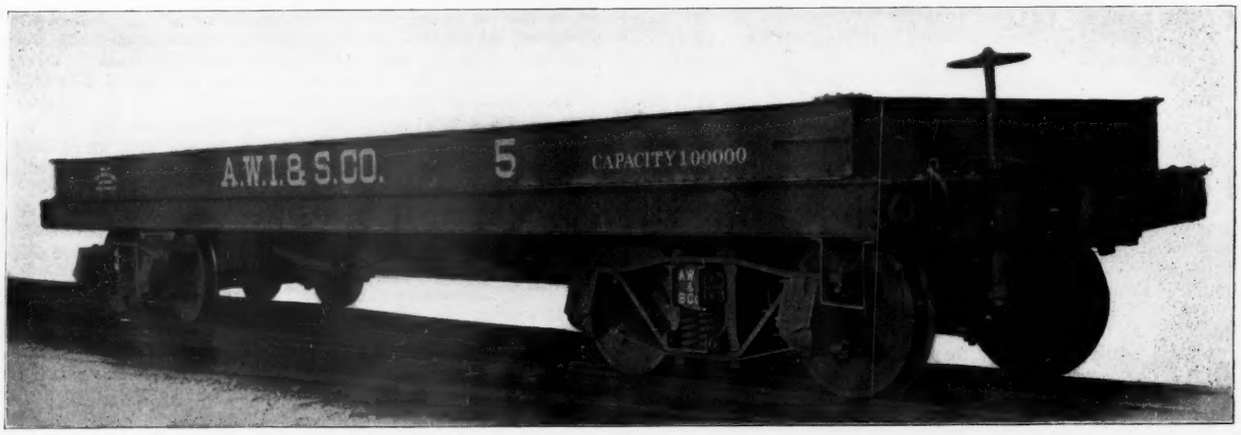
Among the recent cars turned out by the Middletown Car Works are the first of an order for a number of 40-ton wooden flat cars for the Philippine Railway Co. to be used by the contractors, J. G. White & Co., in building the new lines in the southern islands, and some low side steel gondolas for the Alan Wood Iron & Steel Co.

The Philippine Railway flat cars are narrow gage, 3 ft. 6 in., and are 35 ft. long over end sills, 8 ft. 3 in. wide and 3 ft. 7½ in. high from top of rail to floor. They are built entirely of wood except the built-up steel body bolster. The trucks have 30-in. wheels, double I-beam bolsters and channel spring planks.

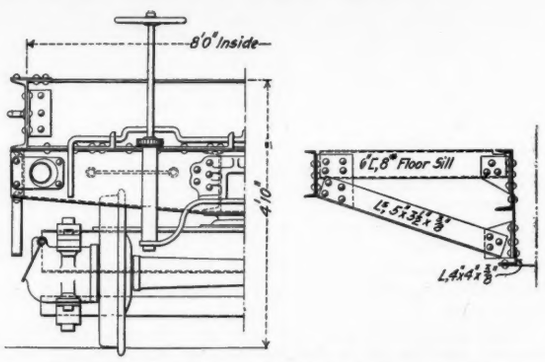
The steel gondolas have underframes somewhat similar to the underframe of the steel gondola for the Newburgh & South Shore



40-Ton Narrow Gage Flat Car Built by the Middletown Car Works for the Philippine Railway.

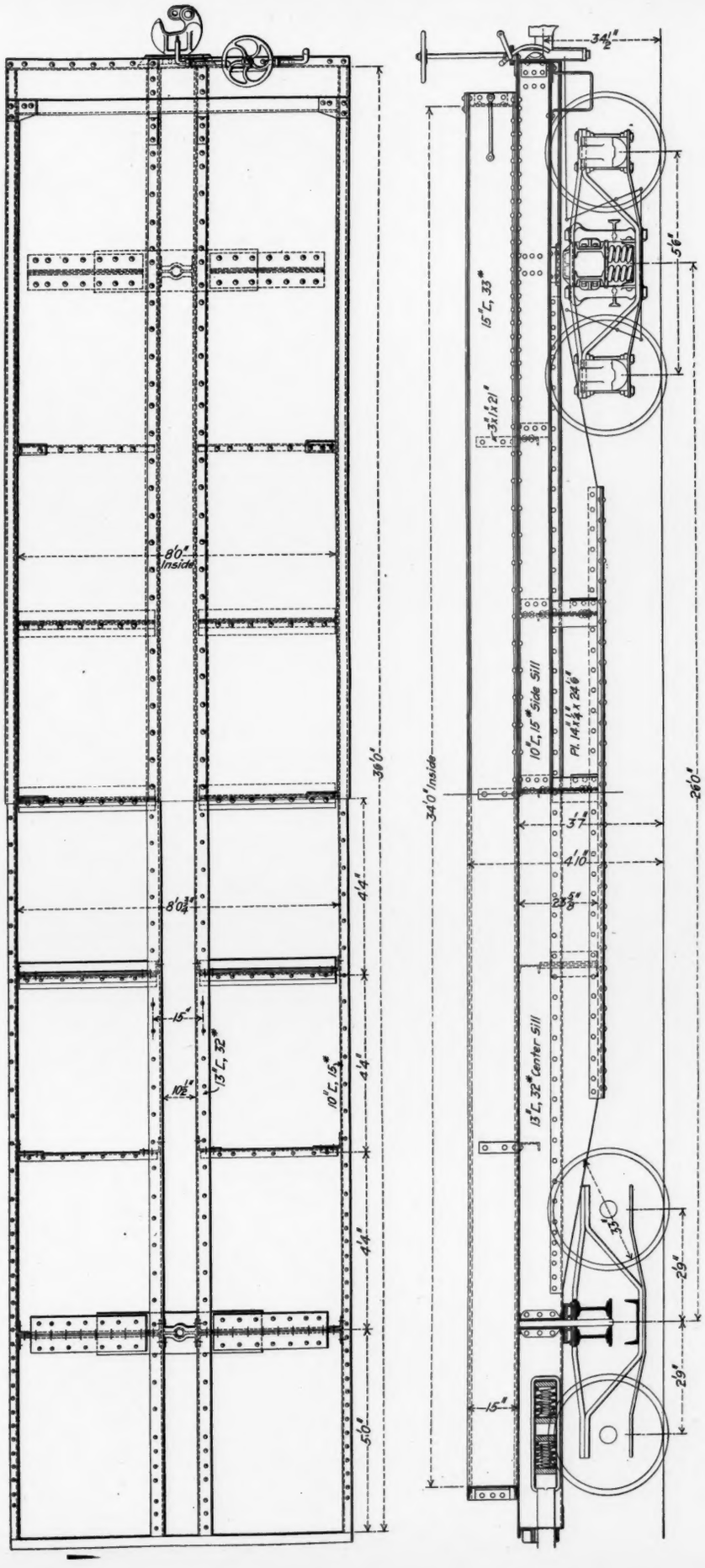


Low Side Steel Gondola Built by the Middletown Car Works for the Alan Wood Iron & Steel Co.



Half End Elevation and Detail of Cross Bearer.

illustrated in our issue of December 21, 1906. The principal differences are in the make-up of the fish-belly center sills and the details of the cross-bearers. In the car here illustrated the center sills are made up of a 13-in., 32-lb. channel, a ¼-in. web plate 14 in. deep, and a 4-in. x ⅜-in. bottom flange angle. This angle extends only along the straight bottom edge of the web plate and is not carried up along the beveled ends to the bolsters. The floor plates



Plan and Side Elevation of Low Side Steel Gondola for the Alan Wood Iron and Steel Co.

of the car are made in two pieces and are riveted on the top flanges of the side and center sills. The gap over the center sills is covered with a strip or top cover plate riveted on top of the floor sheets. A corresponding bottom cover plate extending the length of the bottom flange angles forms a box girder of the center sills. The cross-bearers instead of being continuous angles bent to shape and passing under the center sills are made up of short pieces of 5-in. x 3½-in. x ⅜-in. angle iron riveted to angle brackets attached to the side and center sills. A short piece of 6-in., 8-lb. channel riveted to similar brackets supports the floor sheets and forms the top member of the cross-bearer. The bolsters are built up around the center sill channels with a ¼-in. web plate and four flange angles. The bottom cover plate which passes under the center sills is crimped at the ends to form the body side bearings. The body of the car is formed by 15-in. channels with flanges out. The car is mounted on diamond trucks with double I-beam bolsters and 33-in. wheels.

We are indebted to Mr. Geo. I. King, Vice-President and General Manager of the Middletown Car Works, for the illustration.

Experience with Electric Traction in London.

At two recent railroad meetings in London the following remarks were made about electrification experience:

Mr. A. L. Stride, addressing the London, Tilbury & Southend shareholders, said he was sorry to say that electric working was more expensive than steam. All the companies that had adopted it were much disappointed, as compared with the estimates of cost previously made. Electric traction, however, was in its infancy, and every day its cost was being reduced, but it was not yet down to anything like the cost of steam traction. Especially at the switches and crossings, the electric rolling stock cut the rails much more than any that had been run with steam traction. On the District Railway they had now laid some hardened steel rails which did not much exceed other rails in cost to meet this difficulty.

Sir Charles McLaren, as chairman of the Metropolitan Company, remarked that the life of the rails on the electric system was much less than it was under steam; indeed, the rails were actually pared away by the wheels, and many parts of their line had had to be relaid with rails of extraordinary hardness, which had added much to the expense. Electrification was undertaken under pressure from the traveling public and the stockholders, but the means of transit in London had since increased enormously, and competition had been very trying. Yet if they had not adopted electric traction when they did they would have been far worse off even than now they were. Sir Charles further remarked that they were very much in the dark as to what the maintenance and depreciation charges on the electric plant and rolling stock would be.

The Shan-tung Railroad (German) in China, 271 miles, in 1905, the first year since its completion, had a train movement amounting to 447,834 miles, equivalent to 2¼ each way daily. Substantially all the trains carried both freight and

passengers, except the work trains. The average train contained about 16 cars, of which about 10 were freight cars. The number of passengers carried was 803,527, of whom 95 per cent. were third class passengers and only ½ per cent. first class. The average distance traveled was 43 miles, and the whole passenger movement was equivalent to 174 persons each way daily over the whole length of the road. The total shipments of freight were 341,530 tons, with an average haul of 111½ miles, equivalent to a daily average movement of 192 tons each way over the whole length of the road. Of the freight tonnage, 51 per cent. was coal (173,926 tons). Beans formed much the largest other item. The gross earnings were $1,912,295 Mexican, equal to $956,148 gold, or $3,528 per mile of road. Sixty-eight per cent. of the earnings were from freight. The working expenses absorbed 47.6 per cent. of the earnings, leaving net $1,849 per mile. The number of employees was 619, which is only 2.3 per mile of road. The number of Europeans was 58, and all the others were Chinese.

Collisions Prevented by Block Signals.

Below is the substance of a report made not long ago to the General Manager of a railroad at the end of its fiscal year showing cases of accidents prevented by the automatic signals on the road in one year. It covers the performance of about 300 miles of automatic block signals on single track, the number of signals being, in round numbers, about 400. It will be noted that 13 butting collisions were prevented. Lives were saved, no doubt, as the line is on one of the busiest single-track lines in the country.

REPORT.

"Herewith list showing accidents prevented by automatic signals since June 30, 190—, including 13 cases of possible butting collisions. We think this makes a good showing and have no doubt other accidents have been prevented, without the facts becoming known. We think this the best argument in favor of the policy of the management to instal safety appliances, and automatic block signals in particular. It has cost, in round numbers, for the maintenance of the automatic signals alone, $50,000; or, including new work, $75,000. At a conservative estimate, considering the local conditions of topography at places where head-on collisions would have occurred without the automatic signals the damage would have been $15,000 per accident; so that the automatic signals have saved $120,000 on account of head-on collisions prevented. We have not kept a record of the rear end collisions that might have occurred but for the use of automatic signals.

"You will note in the list several cases of facing point switches having been left open in the face of passenger trains, and the fact being made known by the automatic signals. We have not taken into account the cost of these possible accidents."

Accidents Prevented by Automatic Signals—Twelve Months.

Date.	Train.	Signal.	Cause.
Sept. 30.	No. 2.	263-2	Switch at London standing open.
Sept.	" 53.	121-2	No. 53 making too close time, met No. 6; had
	" 6.		no order against No. 6; No. 6 stopped by block, backed up over east switch at Hawe and let No. 53 in.
Oct. 24.	" 5.	198.1	Broken rail in track.
Oct. 31.	" 3.	211-1	Cross-over switch open.
Nov. 3.	" 23.	184-1	Broken rail in track.
Nov. 24.	" 3.	194-1	Cross-over switch open.
Nov.	X 1146 East.	125-1	No. 46 failed to have orders.
	No. 46.		
Dec. 8.	" 1.	301-1	Broken rail in track.
Dec. 17.	" 1.	304-1	Broken rail in track.
Dec.	" 32.	151-2	No. 32 at Berlin, end of double track, time order up over No. 35—started to pull out; signal No. 151-2(slotted signal) held train; No.
	" 35.		35 came into Berlin while No. 32 was held by signal. Operator asked for release of signal of despatcher, but was refused.
Jan. 16.	" 5.	328-1	Draw open on bridge.
Feb. 11.	" 1.	328-1	Draw open on bridge.
Feb. 21.	" 1.	77-1	Bolt wedged in switch point.
Feb. 27.	" 1.	233-1	Broken rail in track.
Mar.	" 54.	175-2	Met between stations; lack of orders.
	X 960 East.	174-1	
Mar.	No. 46.	174-2	Met between stations; No. 46 failed to have
	X 1001 East.	173-1.	orders.
Mar.	No. 54.	.....	Met between stations; X 1100 failed to have
	X 1100 East.		orders.
Mar.	No. 96.	125-1.	Meeting point. First to meet at Paris; this
	X 1050 East.	126-2	changed to Cherbourg. Operator at Havre "busted" wrong order. X 1050 started to Paris; stopped by signal; No. 96 flagging block, flagmen met between blocks.
———	No. 36.	135-1	X 950 failed to have orders.
	X 950 East.		
———	No. 3.	123-1	2d. No. 46 doubling into Manhattan; imperfect flagging; signal stopped No. 3.
	2/46		
May 21.	No. 44.	184-1	No. 44 had no orders; X 925 had orders over
	X 925 East.	186-2	No. 44; flagmen met about center of block.
———	No. 31.	149-1	No. 31 ahead of time, running extra; No. 54 had right of track over them to Alaska; No. 31 flagged 149.1, preventing their side-wiping No. 54.
———	No. 31.	135-2	Extra engine flagged 135-2; No. 31 coming in to station; confusion of orders due to change from night to day office; No. 31 did not have right order.
June 22.*	No. 44	121-2	No. 44 flagging block met X 913 and stopped
	X 913 East.		them; No. 44 had orders to use eastbound track; X 913 had no orders.

*On double track.

Captain George J. Grammer.

The following estimate of the late Captain Grammer, Vice-President in charge of freight traffic of the New York Central Lines, comes to us from two of his fellow officers:

Humanity consists, generally speaking, of two classes of people, "types" and "individuals." Those who belong to the class of those who may be termed "types" perform their life's work along set lines and according to fixed and predetermined rules; their personality is merged in the monotonous sameness of the innumerable class to which they belong, and their identity is minimized to the point of effacement. Even when successful, their lives have little effect on current events, and their impressions on their friends and associates are vague and indefinite. When they pass from the field of active work, the ranks close up, the vacancy is filled, and the march of events continues undisturbed and without interruption.

All men, however, are not types. This great country of ours, with its newness and its uncounted opportunities for development, has produced individuals, men who think for themselves along lines of original thought and act for themselves along lines of independent action; men who lead their own lives, think their own thoughts and perform their own deeds; guided in their judgment of right or wrong only by their own consciences, and governed in their relations to their fellow-men by the rule which permits them to do to others only those things which it is their desire to have others do to them.

Of this class of men Captain Grammer was the highest; as original in his thoughts as though he was the first thinker; as positive in his convictions as though the universe depended upon the impregnability of his positions. No question was too great for his mind to settle as his intellect deemed it should be settled, and no incident was too small to demand the concentration of his entire force, both mentally and physically, to bring about its adjustment in the manner which he thought proper.

Like all men of great individuality, Captain Grammer was intense in his emotions of love and friendship. His love for his family amounted to idolatry, but only in its nature exceeded the affection in which he held his friends. Every exaltation and success which came to him in business life, but seemed to draw tighter the bonds of family love which bound him to the circle of his immediate relationship, and the lapse of years seemed but to mellow and ripen the friendship in which he held his companions and associates of earlier days, while in the capacious depths of his great heart he appeared to have not only room but intense appreciation for those who came later into his life.

One of the strongest characteristics of Captain Grammer's individuality was his intense dislike for anything which savored of red-tape or circumlocution. His clear, vigorous and active mind, which carried him at once to the heart of any proposition under discussion, rendered intolerable to him any roundabout or devious methods of performing any work or arriving at any conclusion. As the straight line is the shortest distance between two points, so Captain Grammer's mind suggested to him the quickest and most expedetious methods of performing the duties to which he applied himself.

It was this feature of Captain Grammer's individuality which brought into play his well-known use of the illustrative story or incident, a characteristic exceedingly familiar to all who have been at any time associated with him. Captain Grammer was not a story-teller in the general sense of that term, although one could not be with him on any occasion for any length of time without hearing him make use of one or more illustrative stories. These stories always related to the subject under discussion, and were used as a short cut to the conclusion which Captain Grammer reached and to which he desired to carry his listeners. Captain Grammer's memory was stored with countless numbers of these, accumulated during a lifetime which in even its all too short duration embraced a period and covered a territory as interesting and strenuous as was ever allotted to any man. The effective use of these stories will be long remembered not only by those who happened to be on the same side of the discussion as Captain Grammer, but by his many times discomfited opponents.

Captain Grammer's expert knowledge was not confined to railroad matters; he kept familiar with the details of trade conditions all over the country. From his own sources he gathered statistics showing the condition of crops and the probable grain yield, etc., for all sections of the country, and tabulated them in advance of the government reports; his conclusions were surprisingly right. He always took a leading part in meetings of railroad officials, because, aside from the value of his detailed information, he had an analytical mind and naturally expressed himself easily.

In all men will be found many varying qualities of different degrees of intensity. In Captain Grammer's nature the quality of justice seemed to outweigh all other virtues. As he demanded justice for himself and the interests he represented, so he demanded from himself and from the interests of which he was in charge justice to those with whom he occupied business relations, whether

the relations were those of friend or foe. From that grand character which Captain Grammer built up for himself during a life of trials, temptations, failures and successes, the element of injustice was absolutely omitted.

It was this spirit of fairness and justice which made service under Captain Grammer such a delight to all of his subordinates, and especially to the young men desirous of following in his footsteps and emulating his successful career. To these young men credit was given where credit belonged, and "each tub was expected to stand on its own bottom." Captain Grammer's policy of sticking fast to the old tried and true employee, while at the same time giving the young man an opportunity of showing what he could do, resulted in his surrounding himself with a staff of associates who served him loyally as their chief, loved him as their friend, differed with him when the independence of thought which he had inculcated in them suggested it, and through it all believed in him with all their hearts, trusted him with all their strength and rested confident in the faith that their duties properly performed would bring them the reward to which their merits entitled them.

As a stone dropped into still waters disturbs the surface and sends the waves sweeping across the lake until they fade into the indefinite distance, so the removal from active life of a man like Captain Grammer disturbs the lives of his friends and associates, and the effect of his death sweeps across the years and touches all who have at any time come in contact with him. He will not be remembered as a type of the citizen produced by this country following the Civil War, and he will not be remembered as a type of railroad man produced by the conditions prevailing during the closing years of the nineteenth century, but as long as men love to revere the memory of those who have done great things, thought greater thoughts and dreamed the greatest of dreams, so long will they remember Captain Grammer, the individual.

Government Accident Bulletin No. 21.

The Interstate Commerce Commission has issued accident bulletin No. 21, embodying its report of railroad accidents in the United States during the three months ending September 30, 1906. The number of persons killed in train accidents was 267, and of injured, 3,891. Accidents of other kinds bring the total number of casualties up to 19,850 (1,182 killed and 18,668 injured). These reports deal only with (*a*) passengers and (*b*) employees on duty.

TABLE No. 1.—*Casualties to Persons.*

	Passengers.		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	27	971	115	1,030	142	2,001
Derailments	25	918	80	577	105	1,495
Miscellaneous train accidents	..	19	20	376	20	395
Total train accidents	52	1,908	215	1,983	267	3,891
Coupling or uncoupling	..	...	81	942	81	942
While doing other work ab't trains, etc	..	...	73	4,432	73	4,432
In contact with overhead bridges, etc..	3	15	32	397	35	412
Falling from cars or engines or while getting on or off	42	572	189	3,026	231	3,598
Other causes	13	803	482	4,590	495	5,393
Total, other than train accidents	58	1,390	857	13,387	915	14,777
Total, all classes	110	3,298	1,072	15,370	1,182	18,668

The totals in Table No. 1 continue large. In some few details there are small decreases from the corresponding quarter one year ago, but in general there is no improvement. The causes of the great losses of life and property here shown have been repeatedly discussed in preceding bulletins. The number of passengers killed in train accidents (52 in this quarter) is large, though it includes the results of only three particularly notable cases, namely, collision No. 28 and derailments 10 and 12. The comparison with Quarterly Bulletin No. 17 (a year ago) and also with Bulletin 20 shows the following numbers killed:

	Bulletins		
	No. 21.	No. 20.	No. 17.
1. Passengers killed in train accidents	52	27	43
2. Passengers killed, all causes	110	81	122
3. Employees killed in train accidents	215	167	229
4. Employees killed in coupling	81	68	74
5. Total pasgrs. and employees killed, all causes	1,182	933	1,053

TABLE No. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons Killed.	Persons Injured.
Collisions, rear	424	$388,807	40	463
" butting	257	428,762	59	703
" trains separating	183	92,787	4	83
" miscellaneous	1,027	464,684	39	752
Total	1,891	$1,375,040	142	2,001
Derailments due to:				
Defects of roadway, etc.	318	$255,625	14	353
Defects of equipment	808	620,560	19	224
Negligence of trainmen, signalmen, etc	118	138,830	19	157
Unforeseen obstruction of track, etc..	93	146,814	17	279
Malicious obstruction of track, etc..	18	26,924	5	19
Miscellaneous causes	426	368,967	31	472
Total	1,781	$1,557,720	105	1,495
Total, collisions and derailments	3,672	$2,932,760	247	3,496

Following is the usual list of Class A train accidents—mostly cases in which the damage is reported at $10,000 or over:

TABLE 2*a*.—*Causes of Forty-five Prominent Train Accidents (Class A).*

[NOTE.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars, & roadway.	Reference to record.	Cause.
					COLLISIONS.		
1	R.	F. & F.	2	2	$440	86	2 passengers killed in freight caboose. Train standing at station (1 a. m.) with indistinct tail lights.
2	M.	P. & F.	0	0	600	15	Collision at crossing; signalman disconnected interlocking so that signals could be set clear for both roads at the same time and went out for a social evening; while he was gone, yardmen disobeyed his verbal instructions not to enter upon the crossing.
3	B.	F. & F.	1	16	2,300	45	Conductor of work train failed to arrange for flag protection; 16 laborers injured.
4	R.	F. & F.	0	0	2,535	78	Block-signal operator became confused and gave false clear signal; engineman approached station, disregarding rule to run under control.
5	R.	P. & F.	0	3	2,700	53	Flagman mistook whistle signal to go out, interpreting it to mean come in.
6	R.	F. & F.	0	1	3,000	4	Automatic block signal showed clear falsely; cause not discovered, but believed to be residual magnetism due to lightning.
7	R.	P. & F.	2	6	3,045	64	Wrong signal given at interlocking. See note in text below.
8	B.	F. & F.	0	4	3,113	99	Extra train, waiting on side track for two trains, started out after passing of one train; had answered whistle signal of passing train.
9	R.	F. & F.	7	16	3,420	61	Fast Running under permissive block signal. See note in text.
10	B.	F. & F.	2	3	3,600	51	False clear block signal. See note in text.
11	R.	F. & F.	1	2	3,700	57	Occurred 3 a.m. signalman at B. (3 months' experience) gave false clear signal; the signalman at C, a man of 6 months' experience, claims that he told B to give a permissive signal; flagman of leading train was killed while sitting in his caboose.
12	B.	F. & F.	0	4	3,700	97	Operator, with 4 train orders in his possession, delivered wrong one to a conductor; had sent conductor's signature to despatcher before train arrived.
13	B.	F. & F.	1	2	3,720	6	Butting collision of extra trains; despatcher (4 years' experience) forgot both and sent meeting orders to neither.
14	M.	F. & F.	0	2	3,930	41	Cars broke away from rear of train and ran back down grade. See note in text.
14*a*	B.	F. & F.	0	2	3,980	89	Error in order; despatcher sent it "Right over 27." Operator, 20 years 9 months of age, copied it "Right over 25," and despatcher did not detect wrong repetition.
15	B.	P. & P.	2	5	4,200	80	Mistake in order; receiving operator omitted two words, and despatcher failed to check the error in the repetition.
16	R.	F. & F.	2	0	4,900	90	Inefficient flagging; train approached station not under control; men on leading train on duty 22 hours; on following train, 19 hours.
17	B.	F. & F.	0	1	5,013	55	Continued trip after losing right to road by being 12 hours late; engineman 1 month in the service; conductor, 4 months.
18	M.	F.	1	2	6,500	46	Train parted; rear portion ran into forward; 32 cars in train, only 10 air-braked. Conductor entrusted making up of train to brakeman; this brakeman killed.
19	R.	P. & P.	3	36	7,035	95	Failure of air brakes. Angle cock closed in middle of train. Report says cause unknown.
20	B.	F. & F.	0	0	7,880	54	Engineman overlooked meeting order. See note in text.
21	B.	F. & F.	1	5	10,000	60	Mistake in writing name of station in train order. Operator (experienced) cannot explain.
22	M.	P. & F.	4	35	11,000	91	Freight train switching on main track on time of passenger train.
23	B.	F. & F.	4	2	12,000	13	Engineman, southbound, overlooked meeting order; conductor slow in applying brakes.
24	M.	P. & P.	2	3	12,750	81	Passenger train on siding drifted out onto main track while engineman was reading orders; train struck by express train passing in same direction.
25	M.	P. & F.	0	3	12,800	79	Freight train on siding broke in two; 14 cars ran back down grade. Conductor and brakeman tried to stop cars, but brakes were defective.
26	B.	F. & F.	7	1	13,450	92	Engineman ovedlooked orders; engineman and conductor killed. A brakeman called engineman's attention, but while he read order to verify brakeman's assertion, collision occurred.
27	M.	F. & F.	0	0	13,600	94	Collision at meeting point; southbound approached not under control. See note in text.
28	B.	P. & F.	17	56	14,500	12	Confusion of orders. See note in text.
29	B.	F. & F.	2	5	15,000	3	Conductor, engineman and flagman forgot meeting order. Flagman had

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars, & roadway.	Reference to record.	Cause.
							signed for conductor; conductor asleep in caboose at time of collision.
30	B.	F. & F.	2	4	16,083	8	Misinterpretation of orders; conductor and engineman, on duty 18 hrs.; used main track until 9:30 when order gave them only till 9.
31	B.	F. & F.	0	0	16,835	87	Train stalled 35 mins. failed to flag; men on duty 14 hrs. 35 mins.
32	B.	F. & F.	3	5	29,200	98	Conductor and engineman of extra train overlooked regular.
Total.....			66	226	$256,529		
					DERAILMENTS.		
1	D.	P.	0	7	$2,600	35	Misplaced switch; switch tender having several switches to watch, forgot this one; on duty 18 hrs, the yard being short of men.
2	D.	F.	0	1	4,050	33	Passenger car and 9 freight cars ran away down steep grade; conductor and brakeman carelessly left cars with hand brakes not properly set.
3	D.	P.	0	12	5,100	20	Track out of gage ½-in.; engine swayed so violently as to break a splice bar. Speed, 50 miles an hour; center of boiler 9 ft. 6 ins. above rail.
4	D.	F.	0	3	5,700	105	Freight cars ran back down 3 per cent. grade; brakeman neglected to set enough hand brakes.
5	D.	P.	0	32	6,000	106	Washout; 5:45 a.m.; section foreman blamed for not going out promptly in storm.
6	D.	P.	2	4	7,000	115	Open draw; engineman (good record) killed.
7	D.	P.	0	36	8,200	102	Ran into burning trestle bridge, 6:50 a. m.; fire probably set by spark from a locomotive.
8	D.	F.	2	2	8,780	34	Runaway on steep grade; engineman lost his head and did not recharge air reservoir.
9	D.	F.	0	0	11,600	21	Bridge knocked down by boom of steam shovel.
10	D.	P.	7	40	18,265	23	Excessive speed. See note in text.
11	D.	P.	5	60	38,000	108	Pile bridge weakened by high water; bridge rebuilt in 1904; 17½ ft. high, spans 15 ft.
12	D.	P.	9	43	57,300	101	Misplaced switch; switch light not burning, having been extinguished by high-wind; train approached at 60 miles an hour.
Total.....			25	240	$172,595		
Grand t'l..			91	466	$429,124		

Collision No. 28, the worst in the list, killing 17 persons, was between an eastbound passenger train and a westbound freight. The collision occurred between R and H (H being six miles east of R). At R the night operator held an order for the passenger train to meet the freight at R, but while he was outside of his office with this order, intending to deliver it to the men in charge of the passenger train, the day operator, who had gone off duty a short time before, went back into the office and, hearing a call from the despatcher, took an order annulling the one which had been carried out. This order would have the effect of permitting the train to proceed, but without waiting for the final approval ("complete") of the despatcher, which, under the rule, is absolutely necessary before it is permissible to act on an order, he shouted through the window to the operator outside to permit the train to proceed. This was done, and the train went on to its destruction. The westbound train had, meanwhile, passed H, because the original order, to meet at R, as delivered to that train, was still in force.

The operator who recklessly allowed the eastbound train to proceed on the authority of an order which had not been approved was 21 years old, and had been in the service of the company over four years.

Collision No. 7 occurred at about 10 p.m., and was due to confusion at an interlocking tower on a four-track line. A locomotive (without train) approaching on the eastbound passenger track was to have been diverted to the freight track, and (after the engine had stopped) the switches and signals were so set. After the engine started the leverman began to set the signals and switches for a following passenger train (approaching on the same passenger track), but acted so quickly that he threw the cross-over switch before the empty engine reached it, though it had passed the signal. The engineman, seeing the mistake, stopped; but knowing the passenger train was due he started ahead again slowly, thinking the signal was meant to direct him to proceed to the limits of the interlocking. The leverman then signalled the engine to stop, and immediately followed this with a signal to set back. The engineman, not being satisfied with this, whistled for signals again. He was then given a violent signal to back up, the leverman believing the engine to be on the freight track, to which he supposed it had crossed. The engineman started to back his engine, but just then saw the passenger train approaching at a high speed. He reversed his engine, starting it in the same direction as the passenger train was running, and by so doing lessened the shock of the collision considerably, though the passenger train was running about 50 miles an hour when it struck. Both the leverman and the signalman (his superior) were men of experience, but both of them thought that the empty engine passed the tower on the freight track.

Collision No. 9 in which a work train, not in motion, was run into at the rear by a following freight train, killing seven and injuring 12 of the workmen on the work train, was due to the excessive speed at which the freight train was running. The work train had stopped to take water and the freight train had been allowed to proceed into the block section under a permissive signal, which required the engineman to run at a rate of speed sufficiently low to avoid the possibility of colliding with any standing train; but this requirement was violated. The experience of this engineman was one year eight months.

Collision No. 10 was due to what appears to have been gross carelessness on the part of a block signalman on a single-track line. After giving a clear signal to a northbound train, the train was delayed so that it could not accept and use the signal. The train despatcher then directed the signalman to change the signal to stop, but he did not do so, and the northbound train soon afterwards started and collided with a southbound which had been admitted to the block section under the authority of the train despatcher after he had ordered the change from "clear" to "stop." The signal man absconded immediately after committing this error.

Collision No. 14, occurring at night, was due to a defect in coupling apparatus and to cars being left standing on a steep grade without sufficient hand brakes being set to hold them. A train of 11 cars and a caboose arrived at W., and entered a side track to unload freight. In moving the train back a short distance, the eleventh car became uncoupled from the tenth, and with the caboose behind it ran back down grade five miles to the point of collision. The trainmen were busy unloading freight and did not discover the breakaway until too late to stop the detached cars. The separation of the caboose and express car from the rest of the train was due to the clevis of the lock pin of the coupler of the freight car ahead becoming caught on the buffer of the express car, lifting the pin. The report indicates that the hand brake was set on the caboose, but this was not sufficient to prevent the two cars from running down the grade. The collision wrecked the express car and the caboose, and the wreck took fire. The damage due to the collision and fire together amounted to $3,930.

Collision No. 20 was a butting collision due to forgetfulness on the part of an engineman 21 years old, who had been on duty 39 hours and 25 minutes. He had received a meeting order, but had put it into his pocket without reading it. He ran past the meeting place and struck the opposing train at about 12 miles an hour. This engineman had been in the service four years, having been appointed fireman at the age of 17, and had been an engineman about 10 months. He had been on duty from 11 p.m. on Friday until 2.50 p.m. on Sunday. The conductor, who had been on duty the same length of time, tried to signal the engineman to stop. If, instead of this, he had applied the air-brakes he might have prevented the collision.

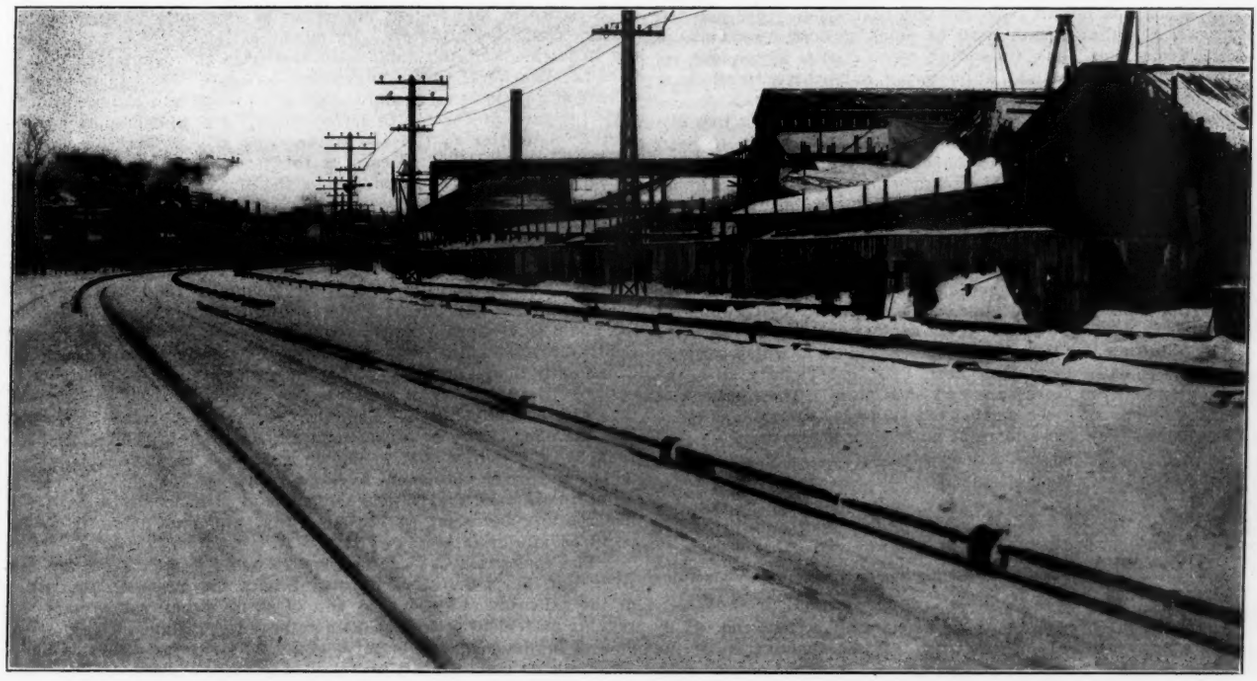
Collision No. 27, causing damage to engines and cars amounting to $13,600, was due apparently to extraordinary carelessness in running a heavy freight train down a steep grade, depending entirely on the hand brakes as a means of controlling the speed. It was a southbound freight train. The air-brakes had been made unserviceable by the breaking of the reversing rod of the air-pump on the engine. The conductor notified the train despatcher at A that he should not dare to start for B, the grade being 124 ft. per mile, descending, unless the up freight, which he expected to meet at B, could take the side track (the rule requiring that ordinarily southbound trains should take the siding). The despatcher, who had been on this division only three weeks, at once gave the desired order, and the southbound train proceeded. It consisted of 61 cars, 17 of them loaded. The conductor, two brakemen, and the fireman manned the brakes, but they were unable to control the train, and it struck the northbound train, at about 15 miles an hour, just as the latter was entering the side track at B. The wreck took fire, presumably from the wrecked engine, and the damage was largely due to the fire. The despatcher, who should have ordered the southbound train held until another engine could be procured, which would not have been long, had had 20 years' experience on other roads. The conductor and the engineman of the southbound train, as well as the two brakemen, had had long experience on trains. They had been on duty only a few hours.

Derailment No. 10 occurred on a 10-deg. curve (superelevation 5½ in.) at the exit of a tunnel, and the engine and first two cars fell into a lake, the engine and tender being entirely submerged. A gas tank of the baggage car exploded and set fire to the smoking car, burning several persons. The tender was the first vehicle to jump the track, but as no defect could be found in its wheels or running gear, the conclusion is that the derailment was due to excessive speed. The train was running at about 45 miles an hour. The engineman was killed, his body being found in the cab of the locomotive at the bottom of the lake. Of the other persons killed, three were passengers.

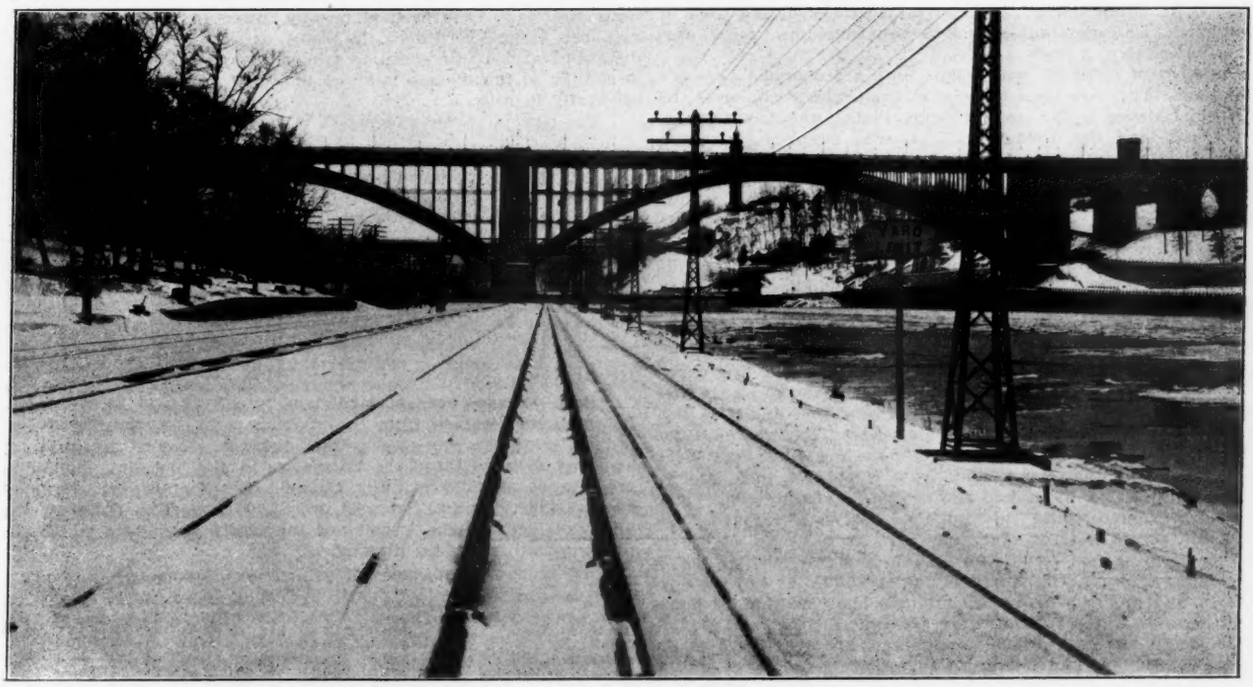
Snow Test of New York Central Motor Car Trains.

The heavy snow storm on February 4 and 5 afforded a good opportunity to test the recently inaugurated suburban electric train service of the New York Central under actual running conditions. The storm began in the morning of February 4 and by night about 4 in. of snow had fallen. A strong wind caused the snow to drift badly. The storm continued during the night and until noon of the next day, when the official records showed a fall of 10.7 in. Rough estimates gave the fall as 12 in. on the level, but the drifts in many exposed places were from 2 ft. to 4 ft. deep. Train service on most of the lines out of New York was delayed from one to three hours on the morning of the 5th.

Within the present limits of the electric zone on the New York Central—below High Bridge, on the Hudson division, and Wakefield, on the Harlem division—the train sheets showed no delays of more than three or four minutes, and these were due to slow working of the interlocking plants, which were kept clear with some difficulty. The electric motor trains ran through on schedule time in every case, and no failures of any kind were reported. As will be seen in the accompanying illustrations from near High Bridge the snow in places completely covered the third rail. The under-running contact shoes, however, cut out a channel under the rail and gave perfect contact. No flanger was run over the road, because the numerous switches below High Bridge make it impossible to keep the blades down on the track for any considerable distance. The performance of the motor car trains in their first encounter with heavy snow was quite as satisfactory in every way as the performance of the electric locomotive on the test track near Schenectady last winter, which was reported in the *Railroad Gazette* February 16, 1906.



Hudson Division near Morris Heights Showing Third Rail Buried in Snow.



Hudson Division North of High Bridge with Snow Up to the Top of Third Rail.

The Lackawanna Fast Freight Service.

The traffic which has been handled by the railroads during the past year and a half has been so great that all facilities have been greatly overtaxed and as a result there have been many serious delays to shipments. New York and Chicago in particular have been congested points where prompt movement has been difficult. The delays have caused great losses and much dissatisfaction among shippers, whose business has often been much interfered with because of them. The modern traffic department works under a different theory from the one in vogue 20 years ago, when rate cutting to secure business was common. To-day the railroads are more than content to maintain a common standard of rates and the competition between different roads is in service and facilities rendered. As an example of the improvement made in the methods of handling the more highly competitive traffic, the fast freight service of the Delaware, Lackawanna & Western is interesting. Its practical results may be judged from the fact that a few years ago the Lackawanna was the seventh road in point of first class tonnage westbound from New York (including other classes of tonnage reduced to a first class basis), while to-day only three trunk lines carry more first class westbound tonnage out of New York.

In developing this fast freight service there have been two distinct aims, first, prompt and regular service, and second, to keep the consignee in touch with the movement of his shipment. The Lackawanna receives through fast freight at any of its various Brooklyn terminals up to 3.30 p.m., and at its New York terminals up to 4.30 p.m. of each day. Instead of designating a particular receiving station for assembling freight for a certain through car, shipments for the various cars are taken at any of the regular stations in New York or Brooklyn. These shipments move westbound in fast freight trains leaving the Hoboken terminal in the evening, and are due in Chicago and St. Louis in 60 hours, or on the morning of the third day. The following is a list of the principal points to which through cars are loaded daily from New York City and vicinity with the schedule time between New York and each point. These schedules are in the majority of cases carried out in actual operation. When there are delays they are seldom of more than a day or two.

Scranton	8 hours.	Columbus	3d morning.
Binghamton	11 "	Cincinnati	3d morning.
Elmira	14 "	Chicago	60 hours.
Utica	17 "	Indianapolis	3d morning.
Syracuse	16 "	Kansas City	4th morning
Buffalo	25 "	Memphis	4th morning
Cleveland	36 "	St. Louis	60 hours.
Toronto	2d morning.	St. Paul	5th morning
Detroit	36 hours.	Minneapolis	5th morning
Toledo	40 "	Rochester	36 hours.
Milwaukee	4th morning	San Francisco	13 days.

The movement of shipments to destination is followed up by the traffic department. Consignees are advised in advance of the forwarding of their freight, name of shipper, number of packages, commodities and weight. Thus they know when to expect their shipments and have at hand the necessary facts for tracing in case of delay. Report is made to the freight agent in charge at New York of the important facts about the movement of all fast freight shipments, including the time of arrival at Chicago, the time of placing at the Chicago transfer freight house and the time of forwarding by connecting lines.

A number of different fast freight lines are operated over the Lackawanna. They are the Lackawanna Line, which runs over the New York, Chicago & St. Louis (Nickel Plate), the Lackawanna-Grand Trunk Line, the Wabash & Lackawanna Despatch, the Lackawanna-Pere Marquette Line, the Lake Shore-Lackawanna Line and the Michigan Central-Lackawanna Line. Freight is shipped by the line which best covers the routing of the shipment. There are three through fast freight trains westbound daily. No. 51 leaves Hoboken at 7 p.m. and runs to Port Morris, which is about 50 miles west of Hoboken, carrying both through fast freight for points west of Buffalo, and for points east of Buffalo. Port Morris is the junction point where through New England freight is received from the New York, New Haven & Hartford over the Poughkeepsie bridge, Central New England and Lehigh & Hudson River. At Port Morris No. 51 is broken up into two sections, the first carrying through freight from New York and New England to points west of Buffalo, the second carrying freight from New York and New England for local points along the Lackawanna lines like Scranton, Binghamton, Elmira, Syracuse, Oswego and Utica and other New York State points. Two other fast freights leave Hoboken a little later in the evening, first No. 53 at 8.30 and second No. 53 at 8.40. These both run through solid to Buffalo, carrying through fast freight for points west of that gateway. At 10.30 No. 55 leaves Hoboken, carrying fast freight for Buffalo and intermediate points on the Lackawanna. First No. 51 is due at Buffalo at 4.20 the next afternoon and first No. 53 twenty minutes later, making 20 hours and 10 minutes as the running time between Hoboken and Buffalo of first No. 53. At Buffalo the through cars are distributed to the different connections and forwarded to western points.

In order to insure prompt movement of cars the agent at New York mails a list each morning to the agents of the different fast freight lines at Chicago, for instance, of all cars which moved westbound the night before from Hoboken for Chicago. This notice reaches the Chicago representatives of the fast freight lines in time for them to notify local agents to look out for and give special attention to the movement of the fast freight cars on the list. On arrival at the different junctions near Chicago, the train is broken up and the cars sent to the transfer freight stations of the different western roads by special delivery; that is, by special switch engines which begin switching at once without waiting for other cars. This, in the case of l.c.l. freight, saves much time over handling between stations by team transfer. Not only is the time of delivery to the western connection reported to the agent of the Lackawanna in New York, but the time at which the car has gone forward on that road, or in the case of l.c.l. freight the time at which the foreman of the transfer station of the western road reports that the car has been distributed and the freight loaded for western points. Thus a prompt and complete record of fast freight movement is constantly at hand at the eastern traffic headquarters. By means of reports from the operating department of the home road and from the agents at Chicago it is possible for the New York agent to locate delays in movement of cars at any point up to and including Chicago, and to take prompt action toward preventing their repetition. For instance, by the report of deliveries to Chicago connections and forwarding of cars by them a congestion of cars at the terminal of any one of the western roads is at once evident by the slower forwarding of shipments by that line.

By means of the prompt movement of cars obtained by these methods it has been possible for the Lackawanna to compete for shipments to points not formerly considered to be in its territory. At least one car is loaded daily for Memphis, Tennessee. This is sent by way of the Nickel Plate to Continental, Ohio; the Toledo, St. Louis & Western (Clover Leaf), to Neoga, Ill., and the Illinois Central to Memphis, thus avoiding the congested territory of the Cincinnati, Louisville and Evansville gateways, where under present conditions a delay of 40 hours can be counted on. In this way cars can be delivered in Memphis the fourth morning. There is also the opportunity to accommodate the service to the traffic. The road has a standing offer to put on a through car to any point for which the daily shipments average 10,000 lbs. A through car to Minneapolis over the Illinois Central and Minneapolis & St. Louis has recently been put on because daily shipments came up to the required minimum.

The congestion of traffic brings up many problems for the railroad man but none more important both for successful operation of the railroads and the good will of patrons than the prompt and regular movement of freight from shipper to consignee. The experience of the Lackawanna in developing this fast freight service shows what can be done toward accomplishing these results.

Lower Passenger Rates on Italian Railroads.

Beginning with Nov. 1, 1906, the passenger rates on the Italian State Railroads have been materially lowered. Instead of a fixed rate per kilometer, differential rates based on a division of the distance traveled into zones or groups have been established. This is similar to the scheme followed in Sweden, Norway, Russia, and especially in Austria.

The new tariff for passengers is as follows:

For a distance of :—	Class First.	Second.	Third.
93.8 miles	$3.85	$2.70	$1.75
124.2 "	4.82	3.37	2.18
186.3 "	6.70	4.66	3.01
248.4 "	8.40	5.76	3.71
310.5 "	9.90	6.66	4.26
372.6 "	11.20	7.36	4.67
434.7 "	12.20	7.96	5.07
496.8 "	12.95	8.51	5.46
552.9 "	13.60	8.96	5.76
621.0 "	14.20	9.36	6.01
683.1 "	14.80	9.76	6.26
745.2 "	15.40	10.16	6.51
807.3 "	16.00	10.56	6.76
869.4 "	16.60	10.96	7.01
931.5 "	17.20	11.36	7.26
962.5 "	17.50	11.56	7.36

Each distance zone is subdivided into 5, 10 and 20 km., varying with its distance from the starting point, for the purpose of proportioning the rate to the exact distance. Tickets are good for as many days as there are kilometers in the journey. Stop-overs are allowed as follows: For 300 km., one; for 600 km., two; for 90 km., four, and for distances over 1,000 km., five. To show the difference between the former and the present passenger tariffs the following will serve for illustration:

Lower Passenger Rates on Italian Railroads.

	Distance, miles.	Former rate. Class First.	Second.	Third.	Present rate. Class First.	Second.	Third.
Turin to Rome	408.6	$16.80	$11.76	$7.64	$11.88	$7.72	$4.95
Naples to Verona	496.8	20.42	14.30	9.28	12.95	8.51	5.50
Milan to Naples	549.0	22.56	15.80	10.26	13.56	8.94	5.71
Modane to Brindisi	739.0	30.17	21.29	13.81	15.34	10.20	6.46
S. Eufemia to Poutedra	804.8	32.39	22.63	14.73	15.82	10.48	6.71
Palermo to Iselle	1,057.6	43.47	30.43	19.76	17.50	11.56	7.36
Gigenti to Modane	1,110.3	44.37	31.05	20.17	17.50	11.56	7.36

The Territory of the Alaska Central Railroad.

BY A. S. ATKINSON.

The enormous growth of Alaska in the last few years is beginning to be reflected in its railroads, which are pushing across seemingly impassable country, fording rivers and marshes, and climbing mountain ranges. If we include the Alaska Midland, which is projected to run from Valdez to the Seward peninsula, there are more than 2,000 miles of railroads projected in Alaska and nearly 300 miles in operation. The Alaska Central is to be 400 miles long, from Seward to Atwood. It has 60 miles in operation to-day, and nearly $2,000,000 has been spent on wharves, buildings and roadbed. Running from Seward, at the head of Resurrection Bay, the road crosses the Kenai peninsula to the coal fields of the Matanuska river and to Knik, the head of salt water and the northernmost fjord of Cook's inlet. It will thus penetrate far into the region of eternal snow and carry freight and passengers to the Arctic circle.

The direct reason for any Alaskan railroad has been the opening up of new mining regions. But the railroads had to consider permanency of mineral resources, and before surveys of routes were finally passed upon mining engineers were employed to make careful examinations of the region. Every Alaskan railroad has some mining region as its objective point. The Nome & Arctic Railway followed the settlement of Nome after the discovery of rich deposits near that city, and the Council City & Solomon River sought to tap the many mining regions in another direction. The Wild Goose Railroad had in view the permanent mining resources on Ophir creek, and the Tanana Mines Railway was built from Fairbanks to the Creeks with a full knowledge of the value of mining deposits in the Tanana valley.

In the same way the Alaska Central has fully estimated the rich resources of its territory. In crossing the Kenai peninsula it had comparatively easy grades, reaching a total elevation of 1,000 ft., but when the road comes to cross the Broad Pass range on its way to Fairbanks it will encounter some great engineering difficulties. The route of the road is northwesterly from Knik to the Sushitna river and thence up this river to the head of navigation on the Tanana river. Before the railroad's engineers had made a thorough survey of the long route the lowest pass that could be found crossing the mountains had a elevation of 2,700 ft., and previous to that the lowest was considered 3,700 ft., but the route of the railroad goes through a pass only 2,300 ft. high.

The road passes up the Sushitna river valley, one of the most fertile in Alaska, where one growth of grain can be raised in spite of short summers. It is expected that this region will eventually provide homes for thousands of farmers whose products will have ready sale to the rapidly increasing population of the mining cities and camps. The valley is some 100 miles wide and 150 miles long, and is clothed abundantly with native grasses, while Indians raise abundant crops of oats and rye. The valley is composed of open bottom lands and dense spruce forests. The climate of this immense fertile region is temperate and equable for Alaska because great rugged mountain ranges inclose the whole Sushitna valley so that winds and storms are diverted from it. The average height of these ranges is from 8,000 to 10,000 ft., while many peaks run up from 12,000 to 20,000 ft. elevation. Mount McKinley, the highest peak on the North American continent, 20,464 ft. high, is on the outskirts of this valley. The mountains on all sides are not only lofty and large, but rugged, bold and picturesque. Two other ranges have peaks reaching 14,000 and 15,000 ft. in height. The peaks of these mountains are naturally snow-capped the entire year, but from June to September the valley is clothed with green. The Sushitna river drains this region, and with its tributaries supplies an abundance of water for irrigation the year round. The streams are not swift and turbulent, but flow on an average four and five miles an hour.

While the valley up which the road winds its way is fertile and rich agricultural land, the abundance of minerals in the mountains is evident. Gold has been washed down from the mountains in rich deposits, and placer mining is carried on often on the very farms where grains and vegetables are raised. A number of large hydraulic plants are in operation in the valley, and there has been a great influx of miners to the valley within the past year. The railroad hopes, however, to encourage farmers to settle in the valleys, for it is predicted that within a few years more money can be made in raising grains and vegetables than in prospecting for gold. The cost of supplies can be materially reduced in Alaska at the present rate of increase in population only by raising home products.

The coal fields of the Mantanuska river, a tributary of Knik arm, is one of the objective points of the railroad. The need of coal in Alaska is important, for the dearth of trees and firewood in many mining camps makes all sorts of mechanical work costly and difficult. Wood for fuel in many parts sells as high as $50 a load. The big mining plants, equipped with mechanical devices for dredging and smelting, have increased the demand for fuel. The railroad which can tap a valuable coal field and transport this fuel to the camps must eventually prove a profitable investment. The early surveys of the government engineers showed that the low-grade lignite coals around Cook's inlet were of little real value, for they were not only inferior for burning but were mixed with slate, clay and sand. But the railroad engineers in surveying for their route discovered that some 50 miles up the Matanuska river there were abundant deposits of a higher grade coal. This coal gave fair burning qualities and appeared in outcropping seams varying from 5 to 35 ft. deep. At Chickaloon creek the outcropping seams run as deep as 35 ft., and at Moose creek coal can be dug from the surface. Some of the coals have shown as much as 75 per cent. of fixed carbon, and the deeper down the better the grade appears.

So far these new coal fields are the richest and best in southwestern Alaska, and it is even anticipated that it will pay to ship the coal to the seaboard and export it to the coast towns. At Port Williams it could be extensively used for smelting purposes, and throughout the Seward peninsula there are many uses to which it could be put. The development of these coal fields will undoubtedly add greatly to the profit and traffic of the Alaska Central and its promoters have this in view in extending the route over a rather tortuous and mountainous region. With coal mines at one end, with abundant rich agricultural lands along the route and a series of seaports at the other end, the railroad should prove a rich investment in the near future.

The future of the Matanuska and Controller Bay coal fields is considered by many to-day as having a more direct bearing upon the development of Alaska than all of her recently discovered gold fields. The former coal fields are not as well developed as the latter and less is known of their probable output and extent, but judging from the work around the Controller Bay coal fields, the complexion of this whole region must within a few years be completely changed. The railroad has had its engineers studying not only the best routes for its lines, but exhaustive examinations have been conducted secretly in the coal fields. It is intimated by some that there are possibilities of coal being found at lower levels as high grade as that of Behring river, which makes a good steaming fuel for any kind of work. A far northerly coal station within steaming distance of the Great Circle route from Puget Sound to the Orient is a factor in the development of the trans-Alaska-Siberia project which may be of deciding importance.

The mineral possibilities of the upper Sushitna and the Cantwell river from Broad Pass to the Tanana are also of much promise. Miners who have advanced into this region report great deposits of gold, copper and other minerals. The possibility of Alaska becoming a great copper exporting region has only recently been known. Her gold has for so long overshadowed every other product that little attention has been directed to the vast coal and copper resources. The copper deposits are enormous, and shipments to the various smelters on Puget Sound have already been sufficient to indicate something of the future of this new industry. Three years ago Alaska produced 1,200,000 lbs. of copper; last year about 60,000,000 lbs. At this rate Alaska copper should prove within a few years a large factor in the copper market of the world. The steady advance in the price of copper has made its mining one of the most profitable industries, and the copper shipped from Alaska the past two years has paid as heavy interest on the investment as the gold mined there. With a new railroad tapping the copper producing regions a great impetus will be given to copper mining.

It is promised by the engineers of the railroad that great areas of copper will be opened up by the Alaska Central which will be second in importance only to those found east of Seward in western Prince William Sound. At La Touche islands in this sound the copper ore occurs in a sloping face of bare iron-stained sandstone and shale, and shipments are made above 9 per cent. copper with but little sorting. The ore from this and neighboring islands is shipped at the rate of 4,000,000 lbs. a month for each mine to the Tacoma smelters as ballast for the steamers returning to Seward from Valdez. The rates of charges to Tacoma are from $2 to $2.50 a ton, which leaves a large profit. With similar copper regions opened up in the region of the Broad Pass the Alaska Central Railroad would find an abundance of freight traffic to keep it busy all the year.

The Alaska Central reached the Matanuska coal fields this fall, but further developments of the region must of necessity be left until spring opens. Preparations have been made to rush a great number of miners to the region, and next summer will witness important development in the mines. Machinery has gone through to the mines, and work of placing this machinery for early spring operations will keep the men busy through the cold weather.

The greatest difficulty found by the railroad has been the labor problem. Laborers to go north and stay have been hard to find. Once in the north the gold fever seizes many and they start out to prospect. Fully half the workmen shipped north have deserted in this way within a few months after arriving. Many stranded adventurers have taken this opportunity to reach Alaska and try their luck in gold hunting. The summer is the season when the

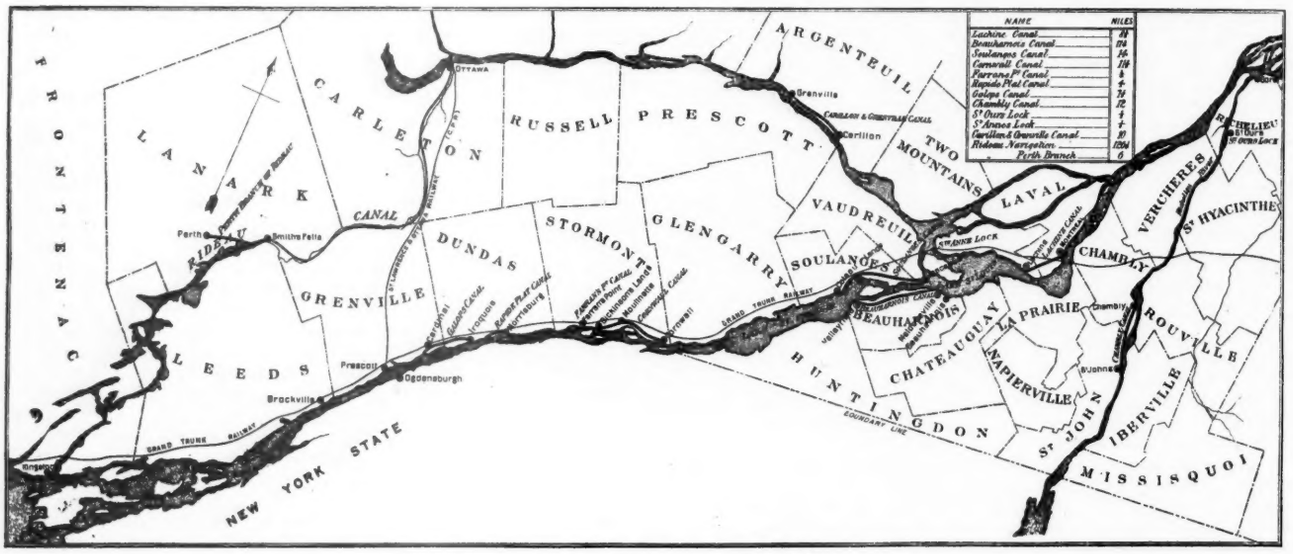
temptation is strongest for prospecting. In winter little more than tunnel and rock work can be carried on and unskilled labor is in less demand. But in winter laborers who have found their summer's prospecting unprofitable are anxious to get work to carry them over another winter. The railroad builders have thus had to work under great labor difficulties, and have had to do a good deal of work in the winter that properly belonged to summer. However, in spite of these discouragements the road has been pushed steadily forward, and to-day it stands a monument to the pluck and skill of American railroad engineers.

The Canal System of Canada.

The St. Lawrence river, with the system of canals established on its course above Montreal, and Lakes Ontario, Erie, St. Clair, Huron and Superior, with connecting canals, afford a course of water communication extending from the straits of Belle Isle to Port Arthur, at the head of Lake Superior, 2,200 miles. The distance to Duluth is 2,343 miles; the distance to Chicago, 2,272 miles.

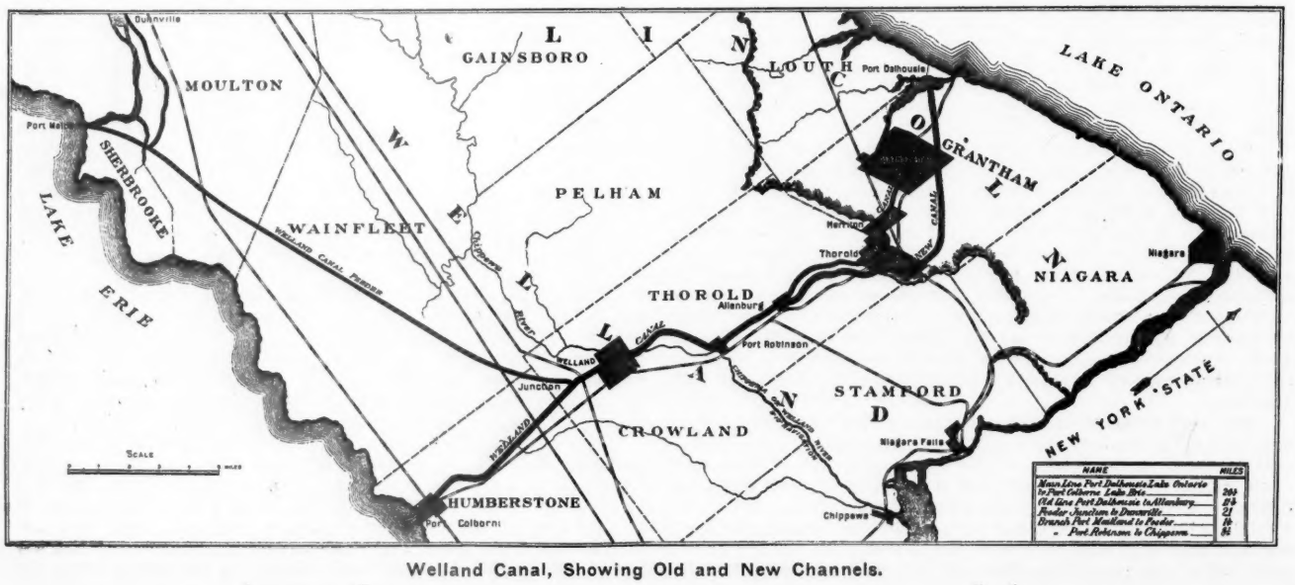
From the straits of Belle Isle, at the mouth of the St. Lawrence, to Montreal, is 986 miles; from Quebec to Montreal, 160 miles. Owing to the shallow water on parts of the river between these two places, particularly through Lake St. Peter, vessels drawing more than from 10 to 12 ft. were formerly barred from passage for the greater part of the season of navigation. In 1826, the question of deepening the channel was first definitely mooted, but it was not until 1844 that any dredging operations were begun. In that year the deepening of a new straight channel was commenced, but the scheme was abandoned in 1847. In 1851 the deepening of the present channel was begun. At that time the depth of the channel at low water was 10½ ft. By the year 1869 this depth had been increased to 20 ft., by 1882 to 25 ft., and by the end of 1888 the depth of 27½ ft. at low water was attained for 108 miles from Montreal to a point within tidal influence. This work is now being continued by the government of Canada. The channel has a minimum width of 300 ft., extending to 550 ft. at points of curvature. The channel is lighted and buoyed. Navigation, which is closed by ice during the winter months, opens about the end of April.

Montreal has by this work been placed at the head of ocean navigation, and here the canal systems of the River St. Lawrence begin, overcoming the various rapids by which the river channel above is obstructed, and giving access through the St. Lawrence canals, the Welland canal, the great lakes and the Sault Ste. Marie canal, to the head of Lake Superior. The difference in level between the point on the St. Lawrence, near Three Rivers, where tidal influence ceases, and Lake Superior, is about 600 ft. The Dominion canals, between Montreal and Lake Superior, are the Lachine, Soulanges, Cornwall, Farran's Point, Rapide Plat, Galops, Murray, Welland and Sault Ste. Marie. Their aggregate length is 73 miles; total lockage (or height directly overcome by locks), 551 ft. A vessel passes through 48 locks in its passage from Montreal, at the head of ocean navigation, to the head of Lake Superior.



St. Lawrence, Ottawa, Rideau and Richelieu Canals.

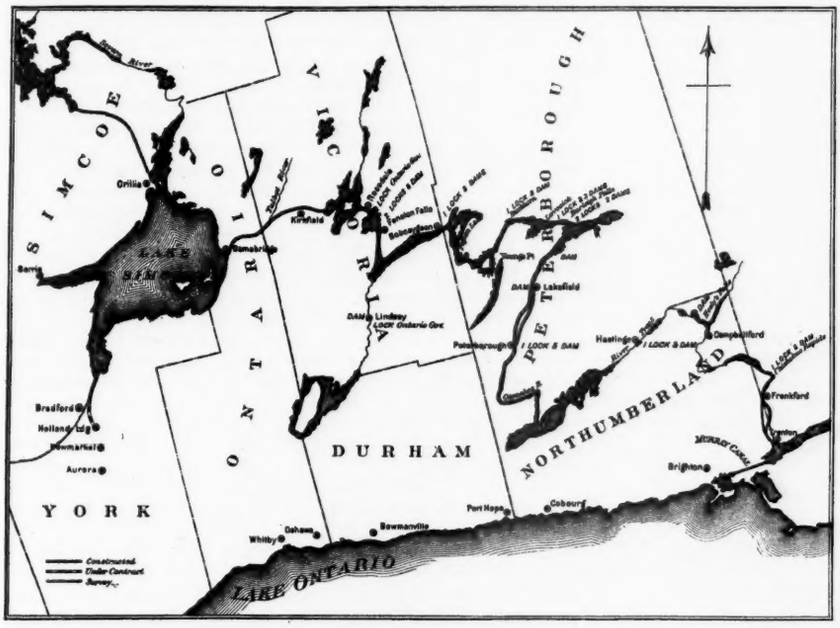
Communication between Lakes Huron and Superior is obtained by means of the Canadian Sault Ste. Marie canal, and also by the St. Mary's Falls canal, situated on the United States side of the River St. Mary. Both these canals are free of toll. The improvement of the United States channels in St. Mary's river has been continued from year to year, so that the dredged areas now total 34 miles in length, with a minimum width of 300 ft., which is increased at angles and other critical points to 1,000 ft. The depth



Welland Canal, Showing Old and New Channels.

is 20 ft. at the mean stage of water. Excavation has now been commenced to afford 21 ft. at the lowest stage of water.

The enlargement of the canals on the main route between Montreal and Lake Erie comprises locks of the following minimum dimensions: Length, 270 ft.; width, 45 ft.; depth of water on sills, 14 ft. The length of vessels to be accommodated is limited to 255 ft. At Farran's, in the Farran Point canal, the lock is 800 ft. long.



Trent Navigation and Murray Canal; Proposed New Water Route Between Lake Huron and Lake Ontario.

There is a similar lock at Iroquois on the Galops canal. The object of these long locks is to pass a full tow at one lockage.

The following table shows in detail the through route, with a minimum depth of 14 ft. of water, between Montreal and the head of Lake Superior. The distances by this route are as follows: Montreal to Port Arthur, 1,223 miles; Montreal to Duluth, 1,357 miles; Montreal to Chicago, 1,286 miles.

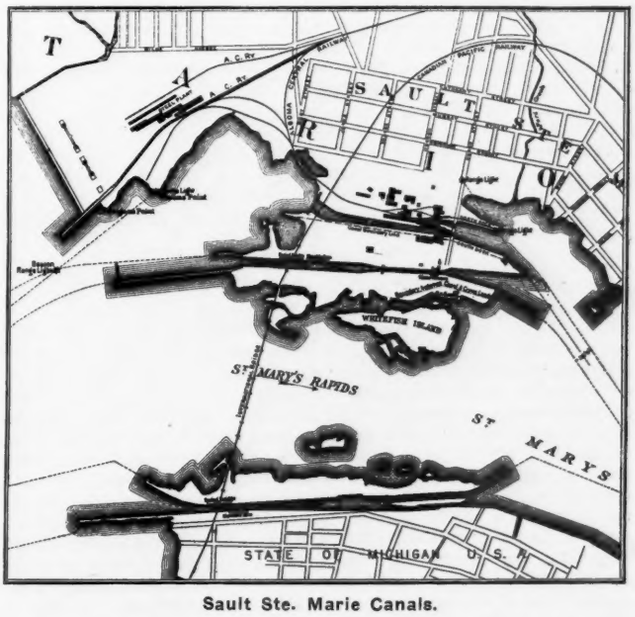
	Miles		Miles
1. Lachine Canal	8½	River St. Lawrence and Lake Ontario.	236
Lake St. Louis and River St. Lawrence	16	7. Welland Canal	26¾
2. Soulanges Canal	14	Lake Erie, Detroit, River, Lake St. Clair, Lake Huron, etc.	580
Lake St. Francis and River St. Lawrence	33	8. Sault Ste. Marie Canal	1¼
3. Cornwall Canal	11	Lake Superior-Port Arthur.	266
River St. Lawrence	5	Total	1,223¼
4. Farran's Point Canal	1	To Duluth	1,357
River St. Lawrence	10	To Chicago	1,286
5. Rapide Plat Canal	3½		
River St. Lawrence	4		
6. Galops Canal	7½		

The Lachine canal extends from Montreal to the town of Lachine, eight miles, overcoming the St. Louis rapids, the first of the series of rapids which border the ascent of the St. Louis river. It has five locks with a total rise of 45 ft. From the head of the Lachine canal to the foot of the Soulanges canal is 16 miles. The Soulanges canal is 14 miles long and has four lift locks with a total rise of 84 ft. From the head of the Soulanges to the foot of the Cornwall canal there is a stretch of 38¾ miles through Lake St. Francis, which is being made navigable for vessels drawing 14 ft. The Cornwall canal is 11 miles long and has six locks with a total rise of 48 ft., and it extends past the Long Sault rapids from the town of Cornwall to Dickenson's Landing. From the head of the Cornwall canal to the foot of the Farran's Point canal the distance on the St. Lawrence river is five miles. The Farran's Point canal enables vessels ascending the river to avoid the Farran's Point rapids, passing a full tow at one lockage; descending vessels run the rapids. The Farran's Point, Rapide Plat and Galops canals are collectively known as the Williamsburg canals. From the head of the Farran's Point canal to the foot of the Rapide Plat canal there is a navigable stretch of 10½ miles. The canal was built to enable vessels going up the river to pass the rapids at Rapide Plat. Descending vessels run the rapids with safety. From the head of the Rapide Plat canal to Iroquois, at the foot of the Galops canal, the St. Lawrence is navigable for 4½ miles. The canal enables the vessels to overcome the rapids at Pointe aux Iroquois, Port Cardinal and the Galops. These three canals are 12 miles long and have a total rise of 30½ ft. The Murray canal is 5¼ miles long and extends through the Murray isthmus, giving connection westward between the head waters of the Bay of Quinte and Lake Ontario, thus enabling vessels to avoid the open lake navigation. The main line of the Welland canal is from Port Dalhousie, on Lake Ontario, to Port Colborne, on Lake Erie, 26¾ miles. This canal has several branches, one of them 21 miles long, but these are all for vessels of smaller draught than 14 ft. From the head of the Welland canal there is deep water navigation through Lake Erie, the Detroit river, Lake St. Clair, the St. Clair river, Lake Huron and St. Mary's river to the Sault Ste. Marie canal, about 580 miles. From the "Soo" canal to Port Arthur is 266 miles, and to Duluth 400 miles.

The Sault Ste. Marie canal is a little over one mile long and has one lock with a total rise of 18 ft. The canal is built through St. Mary's Island, on the north side of the St. Mary's rapids, and, with the St. Mary's river, gives communication on Canadian territory between Lakes Huron and Superior. The following quotation from the report of the Superintendent of this canal is interesting:

"The day of big boats has come, and there are now several building that have too much beam for passing through this lock, which is 60 ft. wide. The other day we locked through the steamer 'J. Pierpont Morgan,' being 600 ft. long and with 58 ft. beam. We did this without any difficulty; this vessel was built by the Steel Trust and was built with several others to fill the capacity of this lock, and not to be at the mercy of the American lock as to size in case of accident to that lock. The question of a new and wider lock must soon be taken up by this department, and as called to your attention last winter, some lands lying between the present canal reserve and the rapids should be procured from the Crown Lands of Ontario before they are taken up by some private corporation, so as to enable a new lock to be built, and by so doing obviate the trouble that the American government is now having across the river in obtaining lands required for a new lock, it having been taken up and built upon by private parties."

One of the accompanying maps shows the Canadian ship canal at Sault Ste. Marie, and also the Mary's Falls canal, on the United States side of the river, another the line of the Welland canal between Lakes Erie and Ontario, showing the old and new channels. As will be seen from this map, from Port Dalhousie to Allanburg, 11¾ miles, there are two distinct lines of canal in operation, the old and the enlarged or new line. From Allanburg to Port Colborne, 15 miles, there is only one channel, the old canal having been enlarged. Another map shows the St. Lawrence, Ottawa,



Sault Ste. Marie Canals.

Rideau and Richelieu canals, and a fourth the Trent navigation and Murray canal.

Besides the through route from tidewater to the Great Lakes, the Canadian canal system has other branches. There is a canal route 245 miles long between Montreal, Ottawa and Kingston. This passes through the Lachine canal, the navigable part of the lower Ottawa river and the Ottawa canals, to the city of Ottawa, thence by the River Rideau to Kingston, on Lake Ontario.

There are 55 locks, and the total lockage, not including that of the Lachine canal, is 509 ft., of which 345 ft. is rise and 164 ft. fall.

The Richelieu and Lake Champlain system begins at Sorel, at the confluence of the St. Lawrence and Richelieu rivers, 46 miles beyond Montreal, and extends along the Richelieu river, through the St. Ours lock, to the basin at Chambly, thence by the Chambly canals to St. Johns, and down the Richelieu river to Lake Champlain. The distance from Sorel to the United States boundary line is 81 miles. At Whitehall, the southern end of Lake Champlain, there is connection with the Hudson river, and thence with New York City. From the international boundary line to New York the distance is 330 miles, making a total of 411 miles from Sorel to New York. The Trent navigation is a series of water stretches which do not yet form a connected system of navigation, but are valuable only for local use. By extensions of this system, now in progress and contemplation, a through route is to be opened between Lake Ontario and Lake Huron. The system is composed of a chain of lakes and rivers extending from Trenton, at the mouth of the river Trent, on the Bay of Quinte, on Lake Ontario, to Lake Huron. The course is as follows. Through the River Trent, Rice lake, the Otonabee river and Lakes Clear, Stony, Lovesick, Deer, Buckhorn, Chemong, Pigeon, Sturgeon and Cameron to Lake Balsam, the summit water, about 165 miles from Trenton; from Lake Balsam by a canal and the Talbot river to Lake Simcoe; thence across Lake Simcoe to the Severn river; thence by the Severn river to Georgian Bay, Lake Huron; the total distance being about 200 miles, of which only about 15 or 20 miles will be actual canal. The distance by this route is 215 miles, of which 150 miles are now navigable and 65 miles unnavigable. This is the route by which Mr. J. J. Hill, President of the Great Northern, has urged the Canadians to build a deep canal to be used for export grain from the Canadian Northwest.

In connection with the question of canal versus railroad transport of grain from the West, the following is a quotation from the recently issued annual report of the Department of Railways and Canals of Canada: It may be noted that whereas 341,431 tons of grain passed down to Montreal through the Welland and St. Lawrence canals, an increase of 143,185 tons over the previous year, the quantity carried to Montreal via the Canadian Pacific and Grand Trunk railroads amounted to 148,377 tons, a decrease of 6,248 tons. Over the route from Depot Harbor on Georgian bay, Lake Huron, via the Canada Atlantic to Coteau Landing, at the head of the Soulanges canal, thence by barge to Montreal, in the season of 1903 the total freight carried was 315,779 tons, 109,937 tons corn and 175,954 wheat; in 1904 the total freight carried was 209,260 tons, 61,675 tons corn and 137,338 tons wheat; in 1905 the total freight was 254,378 tons, 54,272 tons corn and 168,966 tons wheat.

The quantity of grain carried to tidewater on the New York state canals was 216,237 tons, a decrease of 10,630 tons, while the quantity carried by the railroads of the state to tidewater amounted to 3,164,540 tons, a decrease of 115,967 tons. Of the total east and westbound freight carried by the state of New York canals (the Erie, the Champlain, the Black river, the Cayuga and Seneca, and the Oswego), and the competing railroads (the New York Central and the Erie) respectively (amounting in 1905 to 73,753,141 tons—less by 5,242,646 tons than in 1904), the proportion carried by the canals has fallen steadily from 68.9 per cent. in 1859 and 47.0 per cent. in 1869 to 6.8 per cent. in 1898, 7.2 in 1899, 5.2 in 1900, 5.1 in 1901, 5.5 in 1902, 5.6 in 1903 and 4.6 in 1904, and 4.5 in 1905. These canals carried in 1905 3,226,896 tons, an increase of 88,349 tons.

Education of Apprentices on the Missouri Pacific.*

BY S. M. DOLAN, MASTER MECHANIC.

There is nothing new in the idea of affording boys who are learning a trade an opportunity to supplement their work and instructions in shop with studies in arithmetic and higher branches of mathematics, as well as mechanical drawing and other studies. In this, however, the education of apprentices at the Sedalia shops of the Missouri Pacific differs from the plan followed by any other railroad so far as I know, because the students recite their lessons during the regular working hours of the shop and without loss of time to the boys themselves. The beginning of this school was on April 20, 1906. The general manager of a well-known correspondence school brought instructors to Sedalia, assembled all of the 62 apprentices, and explained what it was proposed to do for them. The only restrictions were that the apprentice be under 21 years old, as boys of that age were nearly out of their time, and had reached an age of mind that did not easily take new impressions. The various trades represented were: Boilermakers, machinists, blacksmiths, electricians, tin and coppersmiths, painters and carpenters.

No regular school room being available, the coach paint shop, at that time unoccupied, was used, and being well lighted and heated, proved a very satisfactory location. The boys were divided into squads of three to five without regard to occupation, the foreman being consulted as to the time each boy or group could be spared. The co-operation of foreman was readily given. They were invited by the master mechanic to spend at least 15 minutes a day in the class-room during the time boys in their own gang or department were reciting. After the squads were made up, an assignment of time was made. Squad one reported at 7 a.m., squad two at 7.30, squad three at 8 and so on, last squad reporting about 2 p.m. At the end of 30 days a readjustment was made, the five boys who lead in their studies being assigned to the same squad, this plan being as closely followed as possible. A similar adjustment has been made each month. Soon after opening the school, sets of drawing instruments were offered to the five students who had made the best progress in their studies at the end of 60 days. This had a stimulating effect on all. The squad who won this contest were apprentices in the tin and copper shop, and studied almost every night at the home of one of the boys, each assisting the other. Later on fountain pens were given to all who performed a certain number of examples during 60 days; 16 of the students qualified in this contest. When the class first opened, and for the first 60 days, instruction was given by two young men with university training. Later on this work was assumed by an instructor with university training, supplemented by correspondence school study, also eight years as locomotive fireman and engineer. There is no doubt that this personality has contributed in a marked degree to the success of the school. As the Sedalia shops only went into operation in October, 1905, practically all of the boys were in the first year of their apprenticeship, the only exceptions being those transferred from other shops. The rules of the company require that all applicants for position of apprentice before being employed, pass successfully an examination, consisting of four examples in arithmetic, and receive at least 75 per cent. in writing and spelling. This rule was rigidly enforced at Sedalia. The standing of the apprentices at school previous to employment was as follows:

Graduates from high school	1
Second year in high school	5
First year in high school	4
Eighth grade	17
Seventh grade	11
Sixth grade	11
Fifth grade	4
Fourth grade	9

After eight months of study the entire number completed their arithmetic. Other subjects were covered by the number shown in each case below:

Algebra	22
Logarithms	8
Geometry and trigonometry	2
Geometrical drawing	13
Mathematics entirely	2

Mechanical drawing, none, but five will probably complete by February 15. Subjects taught are arithmetic, elements of algebra, logarithms (common), geometry, trigonometry and drawing. Arithmetic includes addition, subtraction, multiplication and division of whole numbers, fractions and decimals, percentage, involution and evolution, ratio and proportion. Algebra includes addition, subtraction, multiplication and division, to and including quadratics containing two unknown quantities. Geometry and trigonometry take up the study of geometrical construction, mensuration and part of plane geometry. Under trigonometry the handling of the functions, tables, etc., and how obtained. The course in drawing has been made to conform as nearly to actual office practice as possible. It includes geometrical and mechanical, 30 plates in these two subjects being required of each student; practical projections, four plates; development of surfaces, 10 plates. Mechanical drawing also gives detailed information regarding handling and making of blue prints.

The progress made is suggested by the following report of the instructor on individual apprentices:

Student A, machinist apprentice, never reached the 6th grade in public schools, and could scarcely add two fractions, knew nothing of decimals or beyond that. Has finished arithmetic, and can use it, is finishing algebra and doing splendid work in mechanical drawing

Student B, machinst apprentice, 6th grade in public schools, has finished arithmetic, is finishing algebra, and is progressing well in mechanical drawing.

Student C, blacksmith apprentice, never finished 4th grade in public schools, couldn't do a long example in long division, has finished arithmetic, is now in algebra, and doing some of the best work in the class in mechanical drawing.

Student D, boilermaker apprentice, did not get beyond the 4th grade in public schools, has finished arithmetic, is now in algebra, and just beginning mechanical drawing proper.

The boy now farthest advanced in all studies had only reached the 5th grade in public schools. The time lost by apprentices from their regular shop work will average 20 minutes a day, as all their studying is done on their own time, usually at home, but a large number use the study room of the correspondence school located conveniently in the city. No great difficulty was experienced in the beginning in securing regular attendance. As the novelty wore off and lessons required night work and considerable self-denial, interest began to lag. The laggards were taken to task one by one

*A paper read before the St. Louis Railway Club.

by the master mechanic, and kindly but firmly given to understand that regular attendance and progress in studies were as necessary as satisfactory service in shop. Two quit, no doubt rather than pursue their studies; one was dismissed, refusing to study, his work in shop justifying this course. While the difficulty of maintaining interest did not end here, there was a marked improvement, which has continued without interruption to the present time. In fact, the greatest friendly rivalry exists between the different squads and individual students.

You are no doubt by this time convinced that the school has been a good thing for the apprentices, but are probably wondering where the company gets returns for its investment. It took a broad minded, liberal and far-seeing management to start a school of this kind, for with best results, immediate returns could not be expected. This question recently came up, and I will refer to letters from different men. Here is letter from foreman of machine shop:

As far as I am able to judge, the present system is of great benefit for the boy, as well as from the company's standpoint. Especially will this be true later when practical results follow. In offering this advantage and compelling it, as we do here "in individual cases," the company is fortifying itself against incompetency. As a whole the boys are more attentive and more regular in service than before this innovation. I consider them more industrious and appreciative than those who do not enjoy this privilege. The advantages now offered the apprentice is a practical business education in his line.

From foreman of boiler shop:

I have noticed a remarkable improvement in the interest the apprentices are taking in their work in the past six months. I know this from experience, as the boys are constantly asking me questions about the construction and repairs of boilers. All of our boys in the boiler shop that are attending this school are doing some of our best boiler work, and I am satisfied that at the end of four years, these boys will be finished mechanics. It is my opinion that this school given to apprentice boys here, is a great advantage, and I know the boys appreciate it.

From foreman of tin and copper shop:

As you are aware, the boys of our department, I am proud to say, lead the classes. During lunch or noon hour, they are off to their class room, while it is common to hear them discussing having to stay at home at night and work on projections, plates, etc., at washing up time in the evening. These boys can now draft patterns for elbows, tees, cones, etc., which they would not have been able to do had they not taken the course. They also make steam chest and dome gaskets, together with considerable copper pipe bending and brazing. I consider that I have the most apt and progressive lot of boys I have had under my supervision in 15 years' experience as a foreman, and attribute it to this manual or technical course solely.

From Master Mechanic to Superintendent of Machinery:

I am attaching copies of letters received from the various foremen whom the apprentices are directly under. You will note there is a diversity of opinion as to the benefits of this plan. As to my own personal views, I would say that the benefits to the apprentices themselves would justify what might appear to be extravagant claims. Boys who became bread-winners, either through necessity or otherwise, before they had gained even a primary education, have been enabled, practically without cost, to secure an education of a kind best suited to their position. As to the immediate and present advantage to this company to offset the cost through loss of time while they were reciting their lessons and the expense of instruction, it would be difficult to determine, and might be compared to an improvement on the locomotive that we felt satisfied was resulting in a more economical operation, but would be unable to determine its value in dollars and cents. I claim as an advantage to us, that it has resulted in less laying off among the pupils for the reason that their absence from work meant absence from their recitations, and an increased effort to hold their own with the class. It has also aroused a spirit of inquiry that extends to their work, and has made them more useful employees through their ability to do work, knowledge of which might have not been acquired until the latter part of their apprenticeship, if at all. It has also created a feeling of emulation among aspiring and ambitious mechanics, with whom these boys are associated and whose knowledge gained in the school, enables them to lay out work and solve problems that could not be done by the ordinary mechanic. I believe that I can safely say that the company is and will continue to be, the gainer by furnishing this education to their apprentices, and certainly if it retains in its employ only 50 per cent. of the apprentices that pass through this school, it will have a high grade class of mechanics, that will enable the shops to be operated more economically than with the present class of men they are able to secure.

Such classes mean a great deal of self-denial and sacrifice of amusements on part of boys. Their interest must not be allowed to lag. At Sedalia, the instructor makes a weekly report to the master mechanic, showing examples worked, lessons recited, and attendance. If a boy is absent from one or more lessons, the master mechanic goes to him in the shop and asks for explanation, but before doing so has time-keeper check list to see if boy had been absent from work that day. There are only a few cases of non-attendance recorded where boys have been at work; here authority from foreman must be shown. It was thought at first that it would be necessary to inaugurate some system of checking and prevent boys loitering to or from class-room. This has never been found necessary, as they seem anxious to get back to their work and give such service as would eliminate loss of time occupied while at school.

The question of using motor cars on the New Zealand railroad lines has been receiving considerable attention, and, as a result of observations made and information obtained by the General Manager of Railways during his visit to America and Europe last year, it has been decided that the most suitable method of working such a service is by a small locomotive with a combination car and van attached. This system has been adopted on several of the principal railroads in England, and is found to possess many advantages over the self-propelling motor car, and is being adopted by lines which at the outset had favored and even gone to the expense of running self-propelling motor cars. In order to give the system a trial a car 60 ft. long, with accommodation for 24 first class and 48 second class passengers, in addition to a compartment for guards, parcels and luggage has been built. Should the service prove successful it will be extended as circumstances warrant.

Closing Latest Break of the Colorado River Into the Salton Sea.

The latest break in the barriers which the Southern Pacific engineers have been building to divert the flow of the Colorado river from the Salton Sea back to its original channel, as is pretty generally known, occurred about half a mile south of the closure works built across the previous break, by means of which the engineers had apparently finally subdued the river. As reported at the time, the new break was caused by water finding its way beneath and undermining the levee which had been built along the west side of the river for a considerable distance above and below the old break. When it had become sufficiently weakened the levee collapsed, the crevasse rapidly widened, and the waters formed the new channel indicated on the accompanying map of the new break (Fig. 1).

As the map shows, the closure works for the previous break consisted of earth dams built out from the north and south sides of the crevasse to bulkheads 600 ft. apart about the middle of the

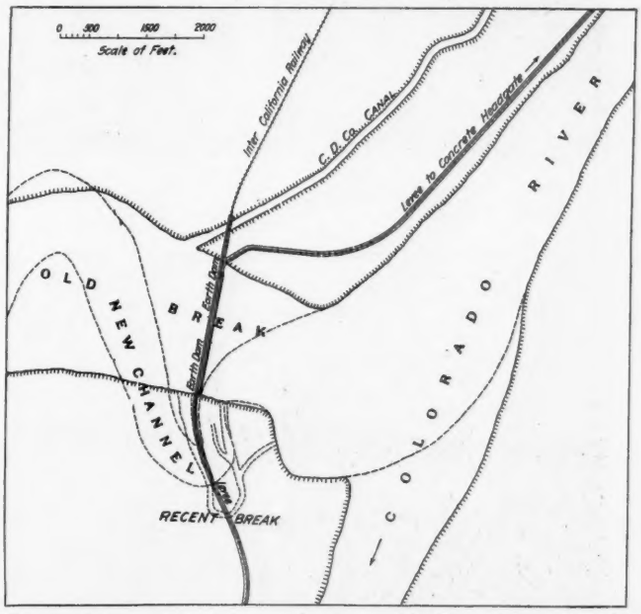


Fig. 1—Map of Latest Break in the Mexican Branch of the Colorado River.

channel. The spur track (called the Inter-California Ry.) built down from the main line to bring material was carried out along the dam, crossing the 600-ft. opening on pile bents, and continued along the south portion of the dam. A brush mattress had been laid on the bottom of the central opening to form a foundation for a rock fill, and the opening was then closed by rock dumped from trains on the trestle. This very brief outline conveys no idea of the tremendous difficulties overcome in accomplishing the task, of the vast quantities of material handled under the most adverse conditions, and the urgent need of rushing the work with all of the energy possible to concentrate upon it. The work had barely been completed and the river restored to its original channel when an 8-ft. rise came and the weakened levee, unable to withstand the pressure, let go, and the waters quickly found their way back to the Salton Sea channel, compelling the work to be done all over again at another point—the seventh attempt to control the river.

The work referred to in the previous paragraph constituted the fifth and sixth attempts, and during the latter a second trestle was thrown across the channel 30 ft. above the first one, from which rock was also dumped, enabling a much greater width of rock-fill dam to be obtained than was possible from the single track. In the present work the same methods are being followed as in the previous attempt. The track was extended southward to the new break and a trestle built across the channel. Work on this trestle

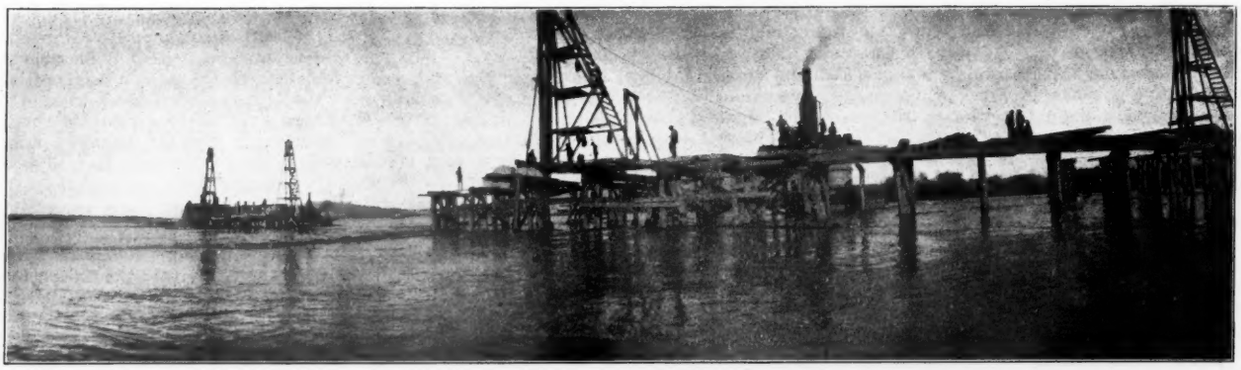


Fig. 2—Looking Upstream, Jan. 23, Through Break in Trestle Caused by Second Rise.

Fig. 3—Jan. 24—North End of Trestle Showing Break Nearly Repaired.

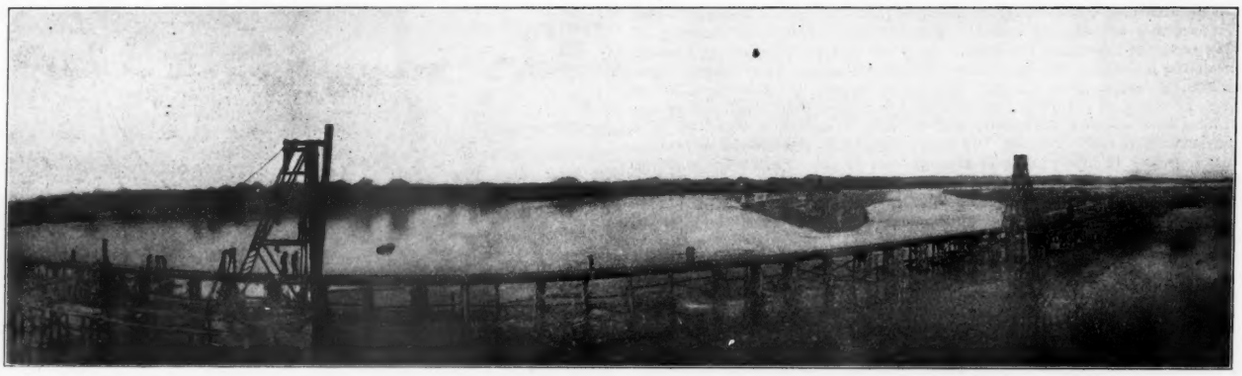


Fig. 4—Jan. 28—Lower Line of Trestle Completed and Pile Drivers Working at Each End of Upper Trestle.
(Appearance of curve due to camera.)

Fig. 5—Jan. 28—Unloading Large Rock from Cars by Hand; Repairing Colorado River Break.

was hampered and delayed by rises in the river, two more of which have occurred since that causing the present break, both of which washed away portions of the trestle. It was finally completed, however, on January 26, and closure of the crevasse immediately begun by rock filling. Meantime an auxiliary trestle was being thrown across above the first, as in the previous case. Rock has been deposited at the rate of 3,000 cu. yds. a day.

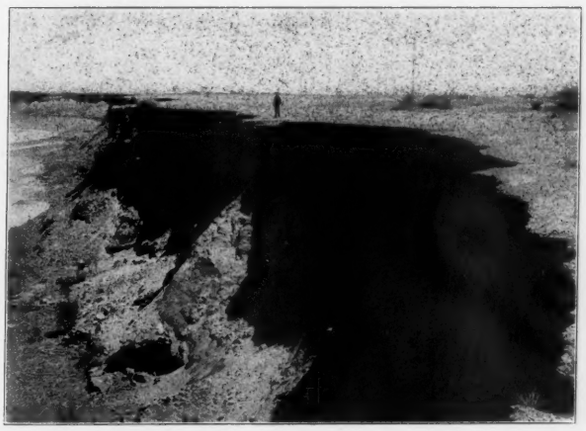
Through the courtesy of Mr. J. Kruttschnitt, Director of Maintenance and Operation of the Southern Pacific, we are enabled to show herewith some snap-shot progress views of the work, numbers of which are sent to him in connection with daily reports on its progress. They convey some idea of the magnitude and character of the task. Fig. 2 was taken on Jan. 23 and shows the second break in the trestle caused by the last rise in the river. And it is of interest to know that this river, wild and uncertain as it is known to be at all times, subject to sudden and unexpected floods, has during the period since the efforts at its restoration were begun acted almost as if bewitched. Never before have such a rapid succession of rises been known, some of a volume as large as ever recorded; and several of them occurring at critical stages of the work, almost as though the premeditated act of something of intelligence. It is this feature of the river's action that has enabled it to baffle the previous efforts of the engineers to control it.

Fig. 3 was taken on the upstream side of the break shown in Fig. 2 on the day following the latter, and shows the progress made toward closing same during the 24 hours; also the north end of the second trestle is seen. An idea of the swiftness of the current may be gained from this view. The completed lower line of trestle is shown in Fig. 4, and the pile drivers working on the upper line. A fair idea of the width of the break is conveyed by this view. Fig. 5 shows a rock train being unloaded. All of this work had to be done by hand, of course, the large boulders being pinched off with bars, as appears in the photograph. The break was finally closed at 6 p.m., Feb. 11; 15 days and 2 hours after the first dump-

The Salton Sea, Showing Section of Submerged Track.

Washed Out Railroad Tracks.

Building Dikes.



New Channel of the Colorado River.

Train Crossing Salton Sea.

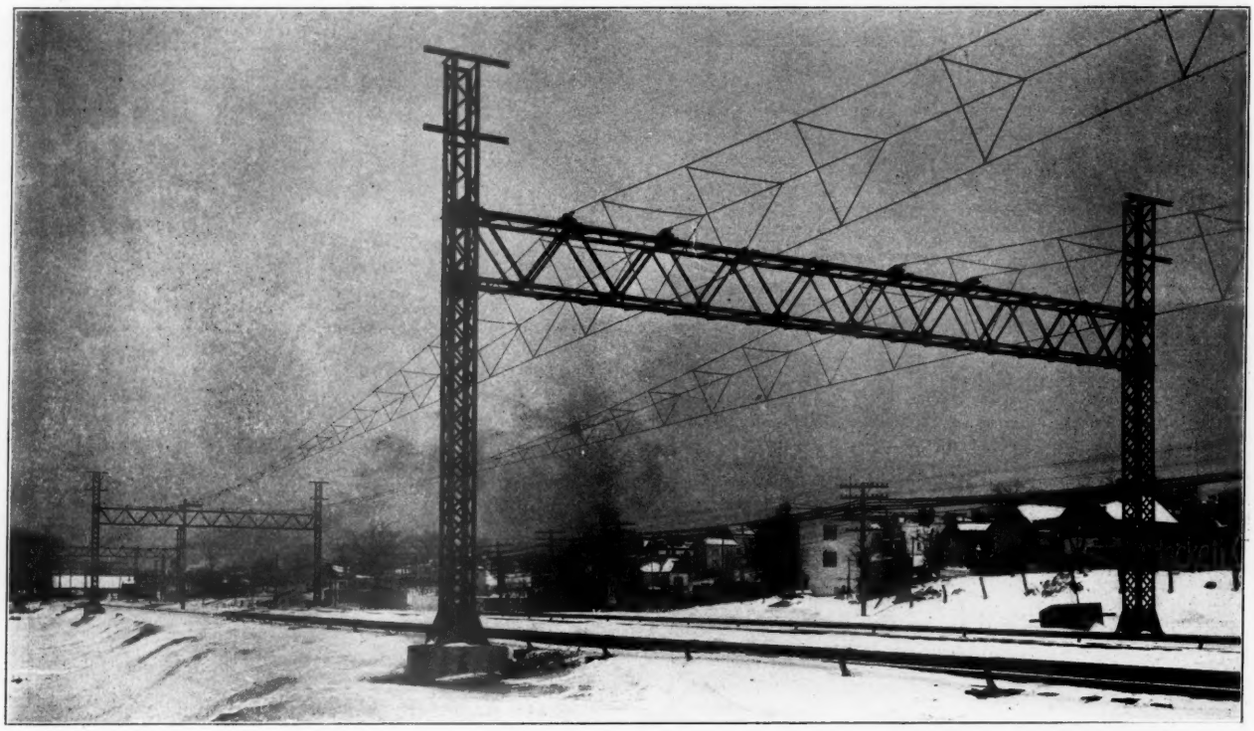
California Development Co.'s Steamer at the Colorado River.

ing of rock. Seventy-seven thousand yards of material, mostly rock, were used. The depth of water at the beginning was 34 ft., and there was a 4½ mile current.

New York, New Haven & Hartford Overhead Construction.

The accompanying photograph shows the overhead construction on the New York, New Haven & Hartford near Wakefield, N. Y. The photograph was taken at the point where the New Haven meets the New York Central's electric division, and the third rail used on the latter's line is shown in the engraving.* The overhead construction is known as the double catenary type, and consists of two steel cables carrying the copper trolley wire by means of triangular supports placed about 10 ft. apart. The trolley wire is held to the triangular supports by clamps which grip the wire in grooves drawn in its sides. The supporting bridges are at intervals of about 300 ft.; the sag of the supporting or messenger cables between these points is about 6 ft., while the trolley wire is held nearly horizontal about 22 ft. above the track. The messenger cables are fastened to heavy insulators on the bridges, but the trolley wire passes underneath without any suspension other than the triangular supports. The trolley wire and messenger cables are mechanically and electrically connected. The line is "staggered," that is, strung between each two bridges at a slight angle to the direction of the track, so that it zigzags back and forth, making at each bridge a variation of a few inches from the center line; this evens the wear on the contact rollers on the trolley bows of the locomotive. The structure is to carry 11,000 volts, and is designed to withstand the maximum strain which it may be subjected to when the wires are heavily coated with ice and there is a high wind. Details of the New Haven's electrification plans were published in the *Railroad Gazette* of March 23 and April 13, 1906.

*The bridges shown are designed to span four tracks, but only two tracks are in use at this point, pending changes to be made when the New York Central begins right-hand running on its Harlem Division.



Double Catenary Line Construction for 11,000-Volt Alternating Current; New York, New Haven & Hartford.

Benzoelectric Rail Motor Cars in Hungary.

L'Ingegneria Ferroviaria of Nov. 1 prints full details regarding the benzoelectric rail motor cars in use in Hungary. One exhibited at Milan by the Arad-Csanád Ry. is planned for use on secondary lines, and contains two first class compartments (accommodating 12 persons), one second class (seating 24), a closet and a small baggage compartment. The driver's booth and motor are in front. The truck has two axles, one driven by a four-cylinder De Dion-Bouton benzine motor driving a shaft with which a dynamo is also connected. The dimensions are:

Length (including buffers)	42 ft. 8 in.
Width	10 " 2½ "
Height	11 " 1 "
Distance between axles	29 " 6 "

The car is provided with Boker air-brakes, hand-brake, acetylene lights and hot-water heat. The net weight is 36,000 lbs. and the maximum weight on the axle is 22,000 lbs.

These motors have been adopted to encourage traffic in sparsely populated districts, in connection with lower fares and more frequent service. Whereas the locomotive passenger service shows traction expenses of 18.2c. and revenue of only 13.2c. per train-km., the motors show 4.38 and 26.4 respectively, with a rise in passengers per train-km. from 1.45 to 1.7 in three years. The economy is due to the lighter weight of the vehicle, which can further carry enough benzine for 250 train-miles, while the steam motors can carry economically only enough for 30 miles; there is no loss of time steaming up; there are no sparks and smoke to dirty the cars and start fires; only one man is needed to run the train, replacing both engineer and fireman; and the heating costs nothing, as the water which cools the motor is used for this purpose. The initial expense of maintenance has been much higher than is now confidently expected, as the 30 motors put on simultaneously were found to need minor modifications, and the instruction of the drivers proved costly. As the traffic has so increased that they now have two trailers (138 seats altogether) to a train and need more power, they have decided to substitute 40 h.p. motors for those of 30 h.p. now in use. By using small wheels and setting the floor low, the air resistance is greatly lessened. The smaller motors are calculated for a speed of 20-23 miles per hour, the larger for 33-36. The light rails (about 50 lbs.) and frequent unprotected grade crossings make higher speeds undesirable. There is no vibration at the higher speed, and the brakes, applied at a speed of 36 miles per hour, stop the car within 65-85 yards. The 30-h.p. cars make 1,800-2,400 train-miles per month, the 70-h.p. 3,000-3,300. The best proof of their capacity was given by the trip of the car exhibited at Milan, under its own power, all the way from Arad, via Buda-Pesth, Vienna, Simmering, Laibach, Cormons and Venice, nearly 1,000 miles, in 36½ hours, without any difficulty, in spite of several heavy grades. Benzine was taken on at Buda-Pesth, Vienna, Laibach and Cormons; the average consumption of benzine was 1.84 lb. per train-mile. Two escape valves broke, one near Wiener-Neustadt (repaired in five minutes at the station), the other after reaching Laibach. The schedule speed of 32-34 miles per hour was maintained.

Table of Expense for Benzoelectric Motors.

	Motor		Steam motor coach,
	30 H.P.	70 H.P.	35 H.P.
Combustibles: Benzine, lbs. per mile	1.5	2.0	(coal) 8.34
Expense of service (in cts. per mile):			
Heating material: Benzine	2.49	3.3	(coal) 2.15
Oiling	.47	.62	.19
Other materials	.06	.06	.05
Personnel	1.25	1.35	1.34
Total, expenses, material and labor	4.26	5.30	4.46
Cost of maintenance (wages and materials)	1.31	1.59	1.36
Total expense	5.57	6.89	5.82

GENERAL NEWS SECTION

NOTES.

The Mobile & Ohio has put train auditors on its through passenger trains.

The Pennsylvania Railroad has issued revised instructions to employees in regard to what must be done when any person is killed on the railroad premises.

Both houses of the Indiana legislature have passed a bill requiring all freight trains of 50 cars or less to have a crew of five men, and trains of over 50 cars six men.

The Delaware & Hudson Company at Albany this week confessed judgment in the suits instituted against it by the United States for thirty-three violations of the Safety Appliance Law.

Shippers of apples in Central New York, at a meeting in Rochester last Saturday, declared that thousands of dollars are being lost because of the inability of the New York Central to furnish cars to ship apples before they rot.

The Georgia Railroad has made an increase of 8 per cent. in the wages of machinists, boilermakers and blacksmiths. Men in other departments, who are now on strike, assert that this action is taken by the company for the purpose of forestalling a sympathetic strike.

The Northwestern Lumbermen's Association, at its recent annual meeting in Minneapolis, provided for the establishment of a car service department. A competent man will be secured to devote his attention to tracing cars, locating delayed shipments and otherwise promoting the interests of shippers in the association.

On February 6 the Baldwin Locomotive Works finished their 30,000th locomotive. In 1870, after about 37 years of operation, 2,000 locomotives had been built, and at that time it was the ambition of the management to increase the output to an average of one engine a day. At present the output is about nine a day.

The General Manager of the Pennsylvania Railroad has made a settlement with the locomotive engineers of the company concerning a petition which they had presented in regard to wages, but the announcement gives no information as to the basis on which the settlement was made. It is said that a settlement has also been made with the conductors; but negotiations with brakemen are still pending.

The London & South-Western semi-annual dividend on the common stock for the second half of 1906 has been reduced from the regular 4 per cent. to 3½ per cent., because of the expense of satisfying claims for injuries and deaths in the Salisbury derailment last July. There has been set aside $250,000 to meet these claims, and of this amount about $63,000 has, so far, been distributed. Eight claims for deaths and ten for injuries are still unsettled.

On Monday morning last the Chicago & North-Western delivered in Chicago 1,288 cars of live stock, the largest number ever brought to that city in a single day by one road. About three-quarters of these cars came from Iowa and Nebraska, and were hauled an average of 400 miles at 25 to 30 miles an hour. All of the 35 trains arrived before 5:30 a. m., and the last car was unloaded before 10:30 a. m. The average temperature in Iowa on the day before (Sunday) was about 10 degrees above zero.

The legislature of Alabama has passed a bill limiting passenger fares throughout the state to 2½ cents a mile, and there is no doubt that Governor Comer will sign it. The prevailing rate on most of the lines of the state now is 3 cents a mile. A two-cent law passed in Arkansas, to go into effect April 11, was signed by the Governor on February 11. In Iowa the legislature has passed a bill, in West Virginia a two-cent law has been passed by the legislature and approved by the Governor, and Missouri is likely to have a similar law.

A press despatch from Chicago says that the Chicago, Burlington & Quincy, in its negotiations with the Government for the contract for carrying the through mails between Chicago and the Missouri river, has offered a reduction of about 7 per cent. on the rate heretofore in force, which is that prescribed by law. The reduction is equal to the cost of transferring the through Eastern mails to and from the Lake Shore station in Chicago and was necessary to keep the new contract from going to the Rock Island, which has direct connection with the Lake Shore.

The yard brakemen and conductors in and around New York City who, on December 23, accepted an increase in their wages of four cents an hour, after demanding five cents, and who left to arbitration the question of the one cent in dispute, have lost their case; Judge Gray, of Delaware, who was chosen umpire, has decided in favor of the companies. The roads interested were the Baltimore & Ohio, the Central of New Jersey, the Delaware, Lackawanna & Western, the Erie and the Lehigh Valley. It was said at the time that the New York Central and the Pennsylvania granted the demands of their men.

New Home of the New York Railroad Club.

Beginning Friday evening, February 15, 1907, all meetings of the New York Railroad Club will be held in the new building of the Engineering Societies, 29 West Thirty-ninth street, between Fifth and Sixth avenues. The new quarters will afford members every convenience. On the ground floor and connected with a large foyer are rooms convenient for business appointments, consultations and dinner engagements. The coat room on the second floor is so arranged that quick service will at all times be assured. The auditorium on the fifth floor, in which the meetings will be held, has a seating capacity of 500. Connected with it is a conversation and social room, with a lunch room and caterer's serving room in its rear. At the top of the building there is a fine reference library to which members will have access on meeting nights. The annual electrical night of the club will occur on Friday, March 15, 1907.

Sale of the Ward Line to C. W. Morse.

C. W. Morse has bought $2,000,000 of the $2,500,000 capital stock of the New York & Cuba Mail Steamship Company, known as the Ward Line, for $600 a share, and is offering that price for the remainder. The line has 18 steamers which ply between New York and Havana and Cienfuegos, Cuba, and Tampico and Vera Cruz, Mex. A new company with $20,000,000 capital stock and $10,000,000 or $12,000,000 5 per cent., 10-year bonds is to be formed to take it over.

Control of the Boston & Philadelphia Steamship Co. has been acquired by unknown interests acting through Kidder, Peabody & Co., Boston. The company has $1,500,000 outstanding capital stock and operates seven steamers between Boston, Providence, Fall River and Philadelphia.

Electric Trains on the New Haven and the Harlem.

The New York Central announces that electric trains will begin running on the Harlem division February 17 and that the northern terminus of the electric runs for the present will be at Mount Vernon station, which is about a half mile north of the yard at Wakefield, where the electric trains and engines are stored.

The New Haven road expects to begin running electric trains between New York and New Rochelle by March 1. New Rochelle is about four miles from the junction with the New York Central at Woodlawn.

Interior Communications of Iceland.

Considerable improvements in the means of communication in and with Iceland have been made. A railroad connecting Reykjavik with the coast has been surveyed and the details of construction worked out. It will have a length of 46 miles. On October 3 of the current year Iceland was connected with Europe by a cable. The telephone exchange at Reykjavik has 200 subscribers, and although the yearly subscription is only $9.60 it has declared a 10 per cent. dividend. Three Danish transportation companies keep up intercourse with the island, one of them making eight trips around the entire coast every year. On some of the larger fyords smaller steamers ply regularly. In recent years wagon roads have been built and streams bridged so that wagons can be used where formerly pack animals were the rule.

A Maine View of the Rate Law.

Benjamin F. Chadbourne, Maine Railroad Commissioner, is quoted as follows regarding the Rate Law:

In this state the railroads have always been generous with every enterprise that ever came into Maine, and interested in the development of the state. We have had so little rebating, discrimination and extortion by the railroads of Maine that we did not feel the need of any help from outside sources. But I maintain that the rate bill will give Maine shippers no favor or right they could not have obtained under the former system; no adjustment of questioned charges they could not have secured through appeal to the railroad management. On the whole, the rates have been fair, and both consumer and producer were content.

So far as Maine is concerned, the only effect of the new Rate Law thus far noticed is in the shutting off of interstate passes. Railroad men now shy at a pass as a 2-year-old colt would shy at a white sheet hanging on a line. I believe that there should not

be established an Interstate Commerce Commission regulation of railroad affairs without a requirement of conditions or qualifications.

The organic law should state definitely what qualifications the members of the commission should have, so as to get men of the widest experience that should fit them for the work. For seven men to sit down and undertake to fix rates and govern the operation of 240,000 miles of railroad is an undertaking that, to my mind, seems a hindrance rather than a help to this big country of ours.

Nine-tenths of the Maine freight patrons of the railroads are conservative business men who would suffer what they believed to be a wrong rather than to go to the bother and expense of seeking adjustment through a board at Washington.

State Railroad Legislation.

The manager of a railroad, the mileage of which traverses or touches nine western states, summarizes the state legislation affecting the property as follows:

"Missouri—Bill before legislature to reduce freight rates 12 to 15 per cent. Likely to be passed; railroads will fight.

"Kansas—Bill before legislature to reduce freight rates 10 per cent. Situation doubtful. We recently reduced rates 10 per cent. to comply with railroad commission's demand. New commission now in power wants another cut.

"Iowa—Governor Cummings recommended freight reduction on pretext of discriminations. Iowa is lower than any other western state and lower than it should be, and has been so.

"Illinois—Railroad commission talks of reduction in carload rates in line with our 20 per cent. reduction in less than carload class rates last year. Guess we will have to cut some more.

"South Dakota—Some reductions in class rates demanded by railroad commission. Depends on what happens in other states.

"Minnesota—All lines reduced class rates and are now holding up by court injunction commission's reduction in commodity rates aggregating 20 per cent.

"Nebraska—Agitation for creation of a railroad commission and a general reduction in freight rates. Some concessions likely.

"Indiana—Rate reduction proposed by railroad commission; two-cent fare law inevitable.

"Wisconsin—Two-cent fare bill and agitation generally.

"In every state named there is a two-cent fare bill pending or threatened, and in most of them agitation for reciprocal demurrage is taking shape in legislative documents or will. Increased control by the state is the order of the day.

"Wisconsin, Illinois and Minnesota are holding the railroads to strict account in the matter of capitalization. Some states would interfere in our relations with employees.

"No matter which way we turn 'it is handed to us.' The government proposes to reduce our postal revenue. The Illinois railroad commission has gone so far as to tell us what we should charge for switching in Chicago.

"If rates are to go lower service must be reduced. It is time to ask if the railroads are not being pushed too far.

"There have been some bad wrecks lately for the following reasons:

"1. Overtaxed facilities.

"2. Overworked employees.

"3. Large percentage of green men in service.

"4. Demoralization of rank and file by labor agitation incident to wage advances.

"5. Neglect of regular duties by officials under investigation or defending companies against attacks.

"6. The wrecks themselves—nothing so unnerves men of the rail as a series of bad wrecks.

"To get back to the original argument, we have more business than we can carry, but if our gross increases are more than wiped away by increased cost of operation what is the use of being a railroad manager? And if rates must go still lower why should capital extend or upbuild our mileage? Think it over."—*Wall Street Journal.*

Tie Preservation by Crude Oil.

The Atchison, Topeka & Santa Fe has been experimenting with California crude oil in the treatment of ties, with results so satisfactory that it has now been decided by the management to use this treatment altogether for ties hereafter. The following, by E. O. Faulkner, Manager of the Tie and Timber Department of the road, gives briefly the history of the experiment:

"The statement has been made on more than one occasion by the timber experts that in order to produce decay two conditions must be present at the same time, namely, heat and moisture, from a combination of which spring the organisms producing decay. It seemed to us that if we could, by taking thoroughly air-seasoned wood, in which condition the cells or pores would be comparatively empty, and block them up with some hard substance, this should stop the moisture getting into the wood, and thereby prevent decay. There is one special kind of California crude oil of very low gravity, which has about 75 per cent. asphaltum base and the balance light oils, the greater part of which vaporize on being heated. In the fall of 1901 we took a few New Mexico, Arizona and Texas pine ties, thoroughly seasoned, and treated them with this oil, heated to 180 deg. F., and forced in under a pressure of 150 lbs. to the square inch, whereby the different ties took up from 4 gals. minimum to 8 gals. maximum. We placed them in the early spring of 1902 in our experimental track on the Gulf, Colorado & Santa Fe Ry. between Cleveland and Pelican, where an untreated loblolly tie will not last over two years, or an untreated long leaf tie much over three years. In November last when the Santa Fe officers were making their annual inspection, they personally examined these ties and found that at the end of four years and nine months the oil-treated ties were perfectly sound; and on one being sawed through the middle and under the rail base it was just as sound in the interior as though it had only been a month in the track. Also the spike was in as good condition as the day driven and seemed to hold much better than in untreated ties. Since then we have bored into and examined more of them, and they all showed up very well, so that our people have determined on adopting this treatment for ties, while continuing with creosote for bridge timber and piling. This oil at ordinary temperatures is like molasses, but when heated it becomes perfectly fluid, so that we have no difficulty in getting all the penetration necessary, and by applying a light vacuum at the close it seems to seal the pores so that after the ties are taken out of the cylinder they can be handled without any difficulty, and very little of the oil seems to run out. Of those in the Texas track there has sufficient oil come out of the outside of the tie so that it practically makes a thin asphalt covering."

The company will soon begin the erection of a new preserving plant at Belen, N. Mex. It will be a two-cylinder plant of the same capacity as the plant built last year at Somerville, Tex., except the material yard, which will have about half the capacity. The buildings will be of reinforced concrete, as at Somerville, and the plant designed to work any of the preserving processes, but especially the Rueping. Only Arizona and New Mexico mountain pine will be treated, using creosote for the piling and bridge timber and California crude oil for the ties.

The Western Railway Club Library.

The D. L. Barnes Library of the Western Railway Club was the personal library of Mr. D. L. Barnes, the well-known Chicago engineer, whose brilliant career was cut short by death in 1896. His will bequeathed the engineering library he had accumulated to the Western Railway Club "as a nucleus to form a library of its own." For the purpose of accepting and owning the property thus bequeathed the club was incorporated. For many years before his death Mr. Barnes was the Chicago editor of the *Railroad Gazette*, in addition to his consulting engineering work, and for a number of years after it became club property this paper housed the library free of charge in its Chicago office, then at 1750 The Monadnock.

The library grew steadily by accessions from members and friends of the club and the yearly binding of technical periodicals, and finally reached a point where it appeared desirable to install it in quarters of its own. These quarters were secured in the Old Colony Building, adjoining the office of the Secretary of the club. In order to furnish the room suitably, a fund was subscribed by club members, mostly among the railroad supply men, and new book cases and other necessary furniture bought. These have been installed and the club is now the possessor of a valuable technical library, comfortably and attractively housed, to which the members have access for reference purposes at all times. In the possession of such a library the Western Railway Club is unique among its fellow clubs.

The library is not self-sustaining, however, and is largely dependent on the interest and generosity of members and friends for accessions. Works on railroad and engineering subjects must be added continuously to keep such a library up to date. Publishers of such works who care to present copies to the Western Railway Club Library are sure of their coming to the notice of a considerable body of technical readers. The library feature of the Western Railway Club is entitled to all possible encouragement and deserves the cordial support of all of its members.

Valuation of Wisconsin Street Railways.

The physical valuation of the Milwaukee Street Railway properties, including both city and interurban mileage, is now being determined for the Wisconsin State Board of Assessment and the Railroad Commission of Wisconsin. The valuation staff has been drawn in part from the corps hitherto engaged in the valuation of steam roads in the state of Wisconsin and in part from the Arnold Company, of Chicago, which recently had charge of the valuation of the street railway properties of Chicago. Prof. W. D. Pence, M. Am. Soc. C. E., engineer for the two state commissions, has charge of the valuation, and with him are associated Mr. Bion J. Arnold, M. Inst. E. E., President of the Arnold Company, consulting engineer; Mr. C. M. Larson, chief roadway inspector; Prof. John G. D. Mack, M. Am. Soc. M. E., chief mechanical inspector, and Mr. George Weston, chief electrical inspector.

TRADE CATALOGUES.

Acetylene Car Lighting.—The Commercial Acetylene Co., New York, has issued a large new catalogue of railroad car lighting apparatus of the "safety" storage system, employing cylinders packed with asbestos bricks saturated with acetone. A number of different applications of the system for lighting cars, locomotive headlights, signals, yachts, lighthouses and marine buoys are shown in the front pages, and on the following pages are illustrated the lamps, fixtures and apparatus made especially for this system of lighting.

Air-Cooled Electric Tools.—Catalogue No. 21 of the Chicago Pneumatic Tool Co., Chicago, covers the large line of electric drills, grinders, hoists, drilling stands, etc., made by that company. The devices are carefully illustrated and described, with tables of sizes presenting the essential characteristics, where necessary. General instructions for the care of electric drills are given in the back. The book is printed on plate paper in two colors, with excellent engravings, and is a nice piece of work.

Roofing.—An attractive catalogue just issued by The Philip Carey Mfg. Co., Cincinnati, Ohio, gives "evidence and proof as to the best roofing for modern buildings." The composition and construction of the roofing are explained and its durability and other advantages set forth. Also information regarding its application and care of the roof afterward is given. The book is well printed and illustrated, with special cover design.

The Obermayer Bulletin.—The January-February number of this little magazine on foundry information, published by The S. Obermayer Co., Cincinnati, Ohio, contains, as special articles, continuations of the three series on "Cupola Practice," "The Coke Question in the Foundry," and "The Right Way to Run a Foundry" respectively, and also "The Human Canary" and "Plumbago for Foundry Use."

Wheel-Truing Brake-Shoes.—The Wheel Truing Brake-Shoe Co., Detroit, Mich., has prepared a folder giving 20 reasons why its brake-shoes should be used. The 20 are set forth in as many paragraphs, the initial letters to which form the words "wheel-truing brake-shoe."

Lubricating Oil Storage.—A small folder sent by S. F. Bowser & Co., Ft. Wayne, Ind., shows views of their various styles of adjustable measure lubricating oil outfits, describes briefly their uses and gives ten reasons for using these outfits.

Manufacturing and Business.

Newton locomotive arch bricks, made by the Newton Fire Brick Co., Albany, N. Y., are specified for the 100 Atlantic Coast Line engines recently ordered.

Robt. M. Burns & Co., Chicago, have sold 24 tank cars to the Cornplanter Refining Company, and 10 tank cars to the Sunflower State Refining Company.

The Sullivan Machinery Co., Chicago, has opened a branch office in Birmingham, Ala., at 12 South Twentieth street. Rock drills and their parts, and other machinery, are carried in stock.

The Allis-Chalmers Company recently shipped east a carload of air-brakes for foreign shipment. The company makes the Christensen brake, the exclusive manufacturing rights of which it controls.

R. M. Turner, eastern representative of the American Steam Gage & Valve Manufacturing Company, Boston, Mass., has been appointed Manager of the publicity department. C. H. Mosher succeeds Mr. Turner.

Augustus Dowdell, Railway Representative of Valentine & Co., varnish and paint makers, New York, died on February 10 at his home in Philadelphia. Mr. Dowdell had been in the railroad department of this company for the past 12 years; previous to that he had been with the Gould Coupler Company.

The American Car & Equipment Co., Chicago, has sold to the Bucyrus Co., South Milwaukee, Wis., two gondola cars; to the Blodgett Co., Ltd., Jackson, Miss., twenty-five 40-ft. flat cars of 60,000 lbs. capacity and fifty 80,000-lb. coal cars, and to the W. I. Swain Co., Kansas City, Mo., one private car and one combination baggage and sleeping car.

The branch managers and department managers of the H. W. Johns-Manville Co. recently held their annual convention at the headquarters of the company, 100 William street, New York. Representatives from the several branches and factories were present. The convention ended with a banquet at the Waldorf-Astoria on Friday evening, February 1.

The Secretary of the American Street and Interurban Railway Association has announced the removal of its headquarters on February 12 from 60 Wall street to the Engineering Societies building, 29 West Thirty-ninth street, New York. The association will have larger offices than heretofore, and it is believed that the plan of having the headquarters of all the national engineering and allied societies in one building will greatly promote the general interests and welfare of these associations.

A new branch of the H. W. Johns-Manville Co., New York, has just been opened at 214 Main street, Buffalo. This branch consists of a large retail store, offices and warerooms, and will be under the management of George A. Schmidt, who has been in charge of a special department of the W. A. Case & Sons Manufacturing Co., Buffalo, until recently the Buffalo agents of the H. W. Johns-Manville Co. B. F. Boscoe has been appointed Assistant Manager of the new branch, with office in Rochester.

The Webb C. Ball Co., Cleveland, Ohio, has bought the Kingmoore Block on Euclid avenue just east of Ninth street to provide a new location for the retail department of its watch business. The building is three stories high, has 89 ft. frontage on Euclid avenue, and is 135 ft. deep. It will be considerably enlarged, several new stories being contemplated; also quarters will be built adjoining the present building to accommodate the manufacturing department of the retail store and the wholesale watch department.

Iron and Steel.

W. R. Grace & Co., of New York, are in the market for 18,000 tons of bridge material for export to Bolivia.

The Hudson Companies are in the market for 600 tons of open hearth rails for use in the tunnels under the North river. J. G. White & Co. are negotiating for rails for 17 miles of railroad in Manila.

Bids are wanted by the Council City & Solomon River, 5 Nassau street, New York, for delivery during June and July at the road's present terminal at the mouth of the Solomon river, Seward Peninsular, Alaska, for 10,500 tons of 60-lb. rails, and for fish plates and bolts; also for 270,000 ties and for some other material.

Contracts are reported let to the American Bridge Co. by the Kansas City, Mexico & Orient for a considerable amount of bridge material. The Bessemer & Lake Erie, it is said, has bought 140,000 steel ties. The Syracuse Rapid Transit, and the Richmond Railway & Light Co., of Staten Island, have bought about 9,000 ties.

The Norfolk & Western has bought from the McClintic-Marshall Construction Co. 1,500 tons of structural steel, making a total of 4,500 tons ordered by this road. The Standard Steel Car Co. has given the McClintic-Marshall Construction Co. the contract to put up a steel building 110 ft. x 483 ft., requiring 600 tons of steel, and for an extension to its wheel works at Butler, Pa., requiring about 400 tons of steel.

OBITUARY NOTICES.

Alfred Walter, President of the Seaboard Air Line, died in New York City on February 12 after several weeks illness. Mr. Walter was born in Brooklyn, N. Y., in 1851, and graduated from the Rensselaer Polytechnic Institute in 1872. He at once began railroad work as a rodman in an engineering corps on the Allegheny Valley. He worked up through the engineering departments of this road and other Pennsylvania lines until he was made Assistant Engineer of the Northern Central in 1878. Three years later he was transferred to the motive power department of the Pennsylvania as Assistant Engineer, and in 1882 was appointed Superintendent of the Sunbury division of that road and of the Shamokin division of the Northern Central. In 1889 he was appointed General Superintendent of the Baltimore & Ohio lines east of the Ohio river, and three years later was made General Manager of the Erie division of the New York, Lake Erie & Western, now the Erie. In 1894 he was elected President of the Delaware, Susquehanna & Schuylkill. From 1897 to 1902 he was President of the Lehigh Valley; during this period he had to make a constant up hill fight in trying to operate the road to its greatest advantage, which meant continual opposition to the policy of certain financial interests. After leaving the Lehigh Valley, Mr. Walter was for some years out of railroad work, spending most of the time traveling abroad. In July, 1905, he was appointed Chairman of the Board of the South & Western, and early in the next year was elected President of the Seaboard Air Line.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Western Railway Club.

At the February meeting, which will be held on Tuesday evening, the 19th inst., at the Auditorium Hotel, Chicago, a paper on "The Anatomy of a Railroad Motor and Control Equipment" will

be presented by James Lyman, Western Manager, Engineering Department, General Electric Co. It will be illustrated by stereopticon views.

Joint Meeting of the International and Steam Boiler Makers' Associations.

A joint convention of the International Railway Master Boiler Makers' Association, of which J. T. Goodwin, of the Richmond Works of the American Locomotive Company, is Secretary, and the Master Steam Boiler Makers' Association, of which George M. Clark, 1377 Maplewood avenue, Chicago, is Secretary, will be held on May 21, 22 and 23 at the Hollenden Hotel, Cleveland, Ohio.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Atlanta, Birmingham & Atlantic.—H. H. Milam has been appointed Treasurer.

Chicago, Burlington & Quincy.—L. F. Moore, Freight Claim Agent, having been transferred to other duties, the freight claim department has been transferred from the traffic to the auditing department, and will be in charge of C. D. Bird, Auditor of Freight Accounts.

Georgia, Florida & Alabama.—J. O. Hatch, Secretary and Treasurer, has been elected Vice-President.

Pennsylvania Company.—G. L. Peck, General Manager of the Pennsylvania Lines West, has been elected also a Director of the Pennsylvania Company and of the Pittsburg, Cincinnati, Chicago & St. Louis, succeeding C. E. Pugh, resigned.

Pittsburg, Cincinnati, Chicago & St. Louis.—See Pennsylvania Company.

Operating Officers.

Atlantic Coast Line.—O. H. Page, who was recently appointed Superintendent of Transportation of the Third division, with office at Jacksonville, Fla., was born in North Carolina in 1877. After a common school education, he began railroad work in 1890 as a messenger boy on the Cape Fear & Yadkin Valley, now part of the Atlantic Coast Line. He was made assistant operator and then operator at Fayetteville, N. C., and later worked in various positions until 1899, when the Atlantic Coast Line acquired the road. He then went into the despatcher's office of the Atlantic Coast Line at Wilmington, Del., and in a few months was made assistant to the chief clerk in the office of the Superintendent of Transportation at that place. The next year he was appointed special and traveling car agent, and in 1902 was made chief clerk to the Superintendent of Transportation of the First division. In 1903 he was appointed chief clerk to the General Superintendent of Transportation, and in the early part of 1905 was promoted to be Acting Superintendent of Transportation of the First division. In September of that year he was appointed Superintendent of the Fayetteville district, where he remained until his recent appointment.

Cincinnati, New Orleans & Texas Pacific.—H. M. Waite, Superintendent at Somerset, Ky., has resigned to go to the Seaboard Air Line.

Illinois Central.—Eugene Dailey, who was recently appointed Superintendent at Freeport, Ill., was born at Bloomingdale, Ill., in 1862. After a public school education, he began railroad work in 1878 on the Illinois Central as a messenger boy at Ackley, Iowa; he was made telegraph operator two years later, and in 1881 was appointed train despatcher at Fort Dodge, Iowa. From 1885 to 1898 he was chief train despatcher at Waterloo, Iowa, and Dubuque, and was then appointed Trainmaster at Waterloo. In 1901 he was transferred to Freeport with the same title, where he remained until his recent promotion.

International & Great Northern.—Homer Eads, Assistant General Freight Agent at San Antonio, Tex., has been appointed Superintendent at that place. See International & Great Northern under Traffic Officers.

Pennsylvania Eastern.—C. R. French has been appointed Acting General Manager, succeeding J. G. Ruth, resigned.

Pennsylvania Lines West.—See Pennsylvania Company under Operating Officers.

Southern.—C. S. Lake, Superintendent of the Washington division, has been appointed Superintendent of the Danville division, with office at Greensboro, N. C., succeeding W. S. Andrews, resigned to go to the Cincinnati, New Orleans & Texas Pacific. G. V. Peyton succeeds Mr. Lake, with office at Alexandria, Va.

Traffic Officers.

Chicago, Burlington & Quincy.—See Chicago, Burlington & Quincy under Executive, Financial and Legal officers.

Erie.—H. D. Pheatt has been appointed to the new office of General Agent at Milwaukee, Wis.

Grand Trunk.—F. P. Dwyer, General Western Passenger Agent, has been appointed General Agent of the passenger department at New York.

Illinois Central.—Charles C. Cameron, who was recently appointed General Freight Agent of all the lines of this company, was born in 1869 at St. Louis, Mo. After a public school education, he began railroad work on the Wabash, St. Louis & Pacific, now part of the Wabash. He worked in various positions on this road, on the Atchison, Topeka & Santa Fe, the Missouri Pacific and the St. Louis Southwestern until 1899, when he went to the Illinois Central as Assistant General Freight Agent at Louisville, Ky. In 1903 he was appointed General Freight Agent of southern lines, with office at Memphis, Tenn., where he remained until his recent promotion.

International & Great Northern.—M. H. Trice, Assistant Superintendent at Mart, Tex., has been appointed Assistant General Freight Agent at San Antonio, Tex., succeeding Homer Eads, transferred. See International & Great Northern under Operating Officers.

Lake Shore & Michigan Southern.—F. L. Talcott, Commercial Agent at Buffalo, has been appointed to the new office of General Eastern Freight Agent, with office at that place.

Missouri, Kansas & Texas.—J. R. Ford, General Agent at Mexico City, Mex., has resigned to go into other business.

Missouri Pacific.—J. B. Trimble has been appointed General Agent at Pueblo, Colo., succeeding C. A. Waterman, resigned.

New York Central & Hudson River.—W. H. Northrup, General Agent at Williamsport, has been transferred to Watertown, N. Y. C. Hartigan has been transferred to Buffalo, succeeding W. R. Randolph, who has been appointed General Agent at Albany, succeeding A. E. Brainard. Mr. Brainard is transferred to Williamsport.

Northern Pacific.—J. E. Spurling has been appointed General Agent of the freight department at Billings, Mont., in charge of the territory west of Bismarck and east of Livingston.

Southern Pacific.—H. E. Lounsberry, District Freight Agent, has been appointed General Agent at Portland, Ore., succeeding Archibald MacCorquodale, transferred to the Oregon Railroad & Navigation.

Engineering and Rolling Stock Officers.

Chicago Great Western.—T. H. Bacon, Assistant Chief Engineer at St. Paul, Minn., has resigned to go to another company.

Kansas City Southern.—R. M. Galbraith has been appointed Superintendent of Machinery, with office at Pittsburg, Kan., succeeding F. Mertsheimer, resigned.

Mexican Central.—R. H. Rutherford, Master Mechanic of the Torreon division, has been appointed Master Mechanic of the Aguascalientes division, with office at Aguascalientes, Mex. O. R. Hale succeeds Mr. Rutherford, with office at Torreon, Coahuila, Mex.

Missouri Pacific.—M. J. McGraw, Master Mechanic at St. Louis, Mo., has been appointed Master Mechanic at Sedalia, Mo., succeeding S. M. Dolan, resigned to go into other business. T. F. Carbery succeeds Mr. McGraw. R. G. Long has been appointed Master Mechanic at Fort Scott, Kan., succeeding W. C. Walsh, resigned.

New York, New Haven & Hartford.—A. E. Mitchell, formerly Superintendent of Motive Power of the Lehigh Valley, has been appointed Engineer of Tests of the N. Y., N. H. & H., succeeding L. S. Storrs.

Northern Pacific.—H. E. Stevens has been appointed Bridge Engineer, with office at St. Paul, Minn.

LOCOMOTIVE BUILDING.

The Colorado Midland is reported to be about to buy six locomotives.

The Carnegie Steel Company is reported in the market for two locomotives.

The Erie has ordered 35 heavy freight locomotives for May and June delivery.

The Rio Grande, Sierra Madre & Pacific will shortly be in the market for locomotives.

The Cananea, Yaqui River & Pacific will shortly be in the market for locomotives.

The Illinois Central is reported to have ordered about 50 locomotives from the American Locomotive Co.

The Seaboard Air Line is considering the purchase of 30 freight, 15 passenger and five switching locomotives.

The El Paso & Southwestern is reported to have ordered six locomotives from the American Locomotive Co.

The Sierra Madre Land & Lumber Co. will shortly be in the market for locomotives for its Mexican property.

The Des Moines, Iowa Falls & Northern has ordered three mogul locomotives from the Baldwin Locomotive Works.

The Cuba Company, 80 Broadway, New York, will shortly be in the market for locomotives for its plantation railroads in Cuba.

The Tehuantepec National is expected to be in the market shortly for locomotives. The contracts will be placed through the New York offices, 32 Broadway.

The Chicago, Milwaukee & St. Paul, as reported in the *Railroad Gazette* of January 25, has ordered 50 Prairie (2-6-2) locomotives from the American Locomotive Co.

La Louisa Sugar Plantation Co. will shortly be in the market for locomotives for its plantation in the Santa Clara district, Cuba. E. H. Blackstone, Pittsburg, is President.

The Kansas City, Mexico & Orient, as reported in the *Railroad Gazette* of January 4, has ordered 20 Alfree-Hubbell type simple mogul (2-6-0) type locomotives from the American Locomotive Co. The specifications for these locomotives are similar to those published in our issue of January 4, with the exception of the width of the firebox, which is 54 in. instead of 40 in.

CAR BUILDING.

The Kansas City, Mexico & Orient is figuring on 400 box and 200 stock cars.

The Rio Grande, Sierra Madre & Pacific will shortly be in the market for cars.

The Cananea, Yaqui River & Pacific will shortly be in the market for cars.

The Mississippi Central is building 600 flat cars at its Hattiesburg, Miss., shops.

The Atlantic Coast Line, it is reported, is asking bids on 200 box and 50 flat cars.

The Washington, Baltimore & Annapolis Electric will soon order 25 large interurban cars.

The St. Louis, Brownsville & Mexico is reported in the market for about 1,000 freight cars.

The Eureka & Palisade has ordered 15 Hart convertible cars from the Rodger Ballast Car Company.

The Missouri Pacific is reported to have ordered 750 stock cars from the American Car & Foundry Co.

The Doud Stock Car Co., Chicago, will, in the near future, buy material for repairing cars at its own shops.

The Sierra Madre Land & Lumber Company will shortly be in the market for cars for its Mexican property.

The Charleston & Summerville Electric will shortly ask bids on cars through D. E. Baxter & Co., New York.

The Cuba Company, 80 Broadway, New York, will shortly be in the market for cars for its plantation railroads in Cuba.

The Illinois Tunnel Company, Chicago, is reported to have ordered 500 tunnel flat cars from the Bettendorf Axle Company.

The Merchants Despatch Transportation Co., New York, is reported to be buying material for 500 cars to be built at its own shops.

The Yosemite Valley has ordered one observation car, one first class coach and one combination car from the Hicks Locomotive & Car Works.

The Wabash denies having ordered 1,000 box cars from the American Car & Foundry Co., as reported in the *Railroad Gazette* of February 8.

The Hudson Companies deny having ordered 250 steel cars from the Pressed Steel Car Company, as reported in the *Railroad Gazette* of February 8.

The Tehuantepec National is expected to be in the market shortly for cars. The contracts will be placed through the New York offices, 32 Broadway.

La Louisa Sugar Plantation Company will shortly be in the market for cars for its plantation in the Santa Clara district, Cuba. E. H. Blackstone, Pittsburg, is President.

The New Orleans Great Northern has increased its order with the Pressed Steel Car Company by 50 cars, making the total 350 steel underframe flat cars of 80,000 lbs. capacity.

The St. Louis & San Francisco, as reported in the *Railroad Gazette* of February 8, has ordered 3,000 steel underframe box cars of 80,000 lbs. capacity, 1,000 steel underframe gondola cars of 100,000 lbs. capacity, and 500 steel underframe stock cars of 80,000 lbs. capacity from the American Car & Foundry Co. The box cars will be 40 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The gondola cars will be 41 ft. 6 in. long, inside measurements. The stock cars will be 36 ft. long, inside measurements.

The Erie, as reported in our issue of January 18, has ordered 3,000 box cars from the American Car & Foundry Company, and 50 suburban passenger coaches from the Pullman Company; the latter are for July, August and September, 1907, delivery. The coaches will weigh 86,000 lbs. and will measure 59 ft. long, 8 ft. 9½ in. wide and 6 ft. 8¼ in. high, inside measurements, and 66 ft. 1½ in. long, 9 ft. 8 in. wide and 14 ft. 5 in. high, outside measurements. Bodies and underframes will be of wood. The special equipment includes: High-speed air-brakes, canvas roofs and wide vestibules without traps or vestibule doors.

The Atlanta, Birmingham & Atlantic, as reported in our issue of January 2, has ordered 300 drop bottom gondola cars of 80,000 lbs. capacity from the South Atlantic Car Works for March 1, 1907, delivery. These cars will weigh 40,000 lbs. and will measure 39 ft. 6 in. long, 9 ft. 3¼ in. wide and 3 ft. 8 in. high, inside measurements, and 40 ft. long, 9 ft. 8¾ in. wide and 8 ft. high, over all. Bodies and underframes will be of wood. The special equipment includes:

Brakes	Westinghouse
Couplers	R. E. Janney
Draft rigging	Minor tandem
Journal boxes	McCord
Trucks	Andrews side frames

The Missouri & North Arkansas, as reported in the *Railroad Gazette* of February 8, has ordered 100 box cars of 60,000 lbs. capacity from the American Car & Foundry Company, for April delivery. These cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The special equipment is as follows:

Bolsters	Scullin Gallagher
Brake-beams	Monarch
Brake-shoes	Western Railway Equipment Co.
Brakes	Westinghouse
Brasses	Eureka Brass Co.
Couplers	Climax
Door fastenings	Positive
Doors	Security
Draft rigging	Miner
Journal boxes	McCord
Roofs	Murphy
Wheels	St. Louis Car Wheel Co.

The Detroit United, as reported in the *Railroad Gazette* of February 8, has ordered 50 double-truck city cars and 10 interurban cars from the Cincinnati Car Co. The double-truck cars will weigh 37,300 lbs. (equipped), and measure 41 ft. 4 in. long, 8 ft. 4 in. wide and 9 ft. 1 in. high, over all. The interurban cars will be 46 ft. 4 in. long, 8 ft. 6 in. wide and 9 ft. 7 in. high, over all. The special equipment for both is as follows:

Bolsters	Truss type
Couplers	Detroit United Ry. standard
Heating System:	
For double-truck cars	Detroit United Ry. hot air
For interurban cars	Peter Smith hot water
Platforms	Detroit
Trucks (for double-truck cars)	"Standard"
" (for interurban cars)	Baldwin
Vestibules	Detroit
Wheels (for double-truck cars)	Griffin

The Atlantic Coast Line, as reported in our issue of January 16, has ordered 750 steel underframe flat cars of 60,000 lbs. capacity from the Standard Steel Car Co., 1,000 ventilated box cars of 60,000 lbs. capacity from Barney & Smith, and 1,500 ventilated box cars of 60,000 lbs. capacity from the South Baltimore Steel Car & Foundry Co. The flat cars will weigh about 29,000 lbs. and will measure 40 ft. 8½ in. long, 9 ft. 4 in. wide and 4 ft. 1 in. high, over all. The ventilated box cars will weigh 39,000 lbs. and will measure 36 ft. long, 8 ft. 6 in. wide and 7 ft. 5⅛ in. high, inside measurements, and 36 ft. 9½ in. long, 9 ft. 10 in. wide and 13 ft. 9 in. high, over all. Bodies will be of wood and steel, and underframes of steel. The box cars will have National Malleable Casting Company's door fastenings, A. C. L. standard doors and Murphy outside roofs. The special equipment for all cars includes the following:

Bolsters	Truck—structural steel; Body—pressed steel
Brake-beams	Pennsylvania deck
Brake-shoes	Christie
Brakes	Westinghouse
Brasses	Lead lined solid
Couplers	Tower
Draft rigging	Farlow-Westinghouse
Dust guards	Harrison
Journal boxes	Symington
Paint	A. C. L. standard
Springs	A. C. L. standard
Trucks	A. C. L. standard
Vestibule	A. C. L. standard

RAILROAD STRUCTURES.

Binghamton, Ala.—The Binghamton Terminal Co. has authorized an issue of $3,000,000 of bonds to be used in building the new passenger station here.

Calgary, Alb.—It is announced that the Canadian Pacific will put up a passenger station here to cost $200,000.

Enola, Pa.—A contract is reported let by the Pennsylvania to J. N. Bastress of Harrisburg, for putting up a brick machine shop.

Florence, Ala.—The Southern is asking bids for putting up a new freight house to cost about $60,000 to replace the structure destroyed by fire last year.

Jersey City, N. J.—The Pennsylvania Railroad is to make additions to the Jersey City terminal, to cost approximately $300,000. A new building, 120 ft. by 620 ft., will be put up just to the north of the slip now used for the Twenty-third street ferryboats. Pier D, now occupying the space to be taken up by the new building, will be rebuilt for the extension. Sixty feet will be added to the north end of the present lobby in the passenger station to connect it with the new building, which will have a large immigrant waiting room, 160 ft. long and 120 ft. wide. The addition will be two stories high, except at the west end, where there will be three stories for the use of the Adams Express Company. The remainder of the extension will be used for freight.

Lumberton, N. C.—A brick passenger station is being put up here.

Orange, Tex.—A brick passenger station will be built at this place by the Southern Pacific.

Strasburg, Va.—The Norfolk & Western and the Southern are arranging to put up a passenger station for their joint use here.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alaska Railroads.—It is reported that the Guggenheim interests (American Smelting & Refining Company) have not bought the White Pass & Yukon Railroad, but that they intend to build their own line in Alaska, to connect with their mining properties; also to establish a steamship line between Seattle, Wash., and Skagway.

A favorable report has been made, by the Senate Committee on Territories, on the bill to authorize the Alaska Railroad to build a line from Cordova Bay, Alaska, through copper territory to Eagle. It is thought that the American Smelting & Refining Company is interested in this project.

Arkansas Central.—According to reports work is to be started by C. C. Godman about March 1 on an extension of this road from Paris, Ark., to Dardanelle, 48½ miles.

Atchison, Topeka & Santa Fe.—According to reports from Albuquerque, N. Mex., this company is planning to build a cut off from Rio Puerco to Albuquerque, making that place a junction of the Rio Grande division and the Coast Lines. Such a line will shorten the distance between these places about 20 miles.

Athabaska Railway.—A bill is before the Railway Committee to authorize this company to build a line from Fort Murray, 240 miles north of Edmonton, north to Fort Smith, on the Slave River. 250 miles. The company already has a charter for the Edmonton-Fort Murray section of the proposed line.

Atlantic, Northern & Southern.—Incorporation has been granted this company in Iowa with $500,000 capital to build railroads. J. H. Simmons is President; F. M. Nebe, Vice-President; Joseph Stier, Secretary, and E. Marquis, Treasurer, Atlantic, Iowa.

Brooklyn (N. Y.) Roads.—Bids are wanted February 21, by Bridge Commissioner Stevenson for building an elevated connection on the Brooklyn plaza of the Williamsburg Bridge, the work to be completed by August of this year.

Buffalo Creek & Gauley.—Contracts have been let to J. B. Tully, Sutton, W. Va., for building two miles from Gulf, W. Va., to Rockcamp. Additional contracts are soon to be let for building from Rockcamp to Camden, 29 miles. N. D. Janney, Chief Engineer, Clay Courthouse, W. Va.

Central of Georgia.—An officer writes that the Greenville & Newnan, building from Greenville, Ga., via Luthersville to Raymond, 23½ miles, has completed grading, and expects to have track laid for the entire distance this month. W. J. Oliver & Co., Knoxville, Tenn., are the contractors.

Chicago, South Bend & Northern Indiana (Electric).—This company has been incorporated in Indianapolis, Ind., with a capital of $7,500,000. The company has acquired the Northern Indiana Railway, which is to be extended via Michigan City to Chicago; also from Michigan City to Indianapolis. Charles T. Dieterich, of New York, is President; C. M. Murdock, of Lafayette, Ind., Vice-President; A. E. Dieterich, of New York, Treasurer, and S. T. Murdock, of Lafayette, Secretary and General Manager.

Choctaw, Newcastle & Western.—Incorporated in Oklahoma with $5,000,000 capital by J. R. Lebosquet, of Little Rock, Ark.; S. T. Pierson and W. P. Dix, of Shawnee; L. C. Rose and A. W. Underwood, of Chicago, to build a line from Newcastle via Ade and Panes Valley to Lawton, about 200 miles.

Cimarron & North Western.—Incorporated in New Mexico with office at Raton, to build from Cimarron on the St. Louis, Rocky Mountain and Pacific Northwest to Van Bremmer Park, 36 miles. C. N. Blackwell, W. H. Decker and Albert A. Miller are incorporators.

Connecticut Roads (Electric).—Residents of Hartford have organized a company with a capital of $100,000 to build a line from East Windsor Hill to Broad Brook and Hazardville, a total of 11 miles. W. O. Burr, F. S. Carey, C. S. Hills, G. A. Gray, C. C. Cook and D. W. Hewes are incorporators.

Denver, Northwestern & Pacific.—On the extension, which this company is building from Kremmling, Colo., to Steamboat Springs, Utah, grading has been completed for about 60 per cent. Contracts let to Dunphey & Nelson from Kremmling to Azieve, five miles, and Orman & Crook from Azieve to Steamboat Springs, 85 miles.

Florida East Coast.—The first train from the Florida mainland to the Keys, consisting of a locomotive and the private car of Henry M. Flagler, was run on Feb. 8. One or two locomotives have been running on Key Largo several weeks. Largo is by far the largest key, being 23 miles long. With the draw in operation at Jewfish creek further construction will be facilitated.

Grand Trunk Pacific.—During the past year on the National Transcontinental, the part of the line east of Winnipeg, 9,156 miles of surveys were made, including exploratory, preliminary, first location and final location. Of first location there were 1,734 miles, of revised location 618 miles and of final location 358 miles. At the close of the fiscal year contracts were let and work under way on 150 miles from the Quebec bridge west, also on 244 miles from a few miles east of Winnipeg to the approximate point of junction of the Thunder Bay branch of the G. T. P. near Peninsular crossing west, longitude 92 deg., and on the Cap Rouge viaduct a short distance west of the Quebec bridge.

The statement of Collingwood Schrieber, General Consulting Engineer to the Government and Chief Engineer of the Western division of the Grand Trunk Pacific, on the progress made up to September 1, 1906, in surveys, location and construction is as follows:

Preliminary surveys have sufficiently advanced to submit route maps of the line from Winnipeg touching the towns of Saskatoon and Edmonton, and passing through the Yellow Head Pass to a point on the Pacific slope at the junction of the Salmon river with the Fraser river, about 1,247 miles. Of this the government has approved from Winnipeg to a point a short distance east of Edmonton, about 776 miles in all. Edmonton being favorably situated for the establishment of the principal workshops, sorting and distributing yards, cattle yards, warehouses and grain elevators, a large area of land has been bought for these purposes. Plans and profiles of location have been approved by the government from township 12, range 7, section 4, west of the first meridian (Portage la Prairie), to township 53, range 23, west of the fourth meridian (a point about eight miles east of Edmonton), about 720 miles, upon which section work is in progress. On this section the location has been carefully selected with a view to obtaining first class alinement and favorable grades; the curvature is light and the maximum grades against the traffic moving east are 0.40 per 100 and against the traffic going west 0.50 per 100. In securing this alinement and gradients, heavy work has been encountered in the form of high embankments, deep cuttings and large structures at various points, such as at Pine, Mule, Minnawashta, Birdtail and Cut Arm creeks; the little Saskatchewan river; the Touchwood, Eagle and Beaver hills; the Qu'Appelle valley, and at Battle river.

With a road so constructed and, consequently, capable of economical operation, and with the communication to be afforded with the port of Fort William at the head of navigation on Lake Superior, by means of the branch line now being built from a point on the main line east of Winnipeg, the road should be in an excellent position to share with its competitors the increasing traffic of the Northwest and of the grain fields of the prairies. On the Western division from Winnipeg to the Pacific coast the surveys are not at present sufficiently advanced to enable any reliable opinion to be formed as to the character of the alinement and grades to be obtained through the mountain region. However I feel confident that a satisfactory location will be obtained. The prairie country through which the road passes is a fine farming district, the soil being for the most part rich. Many settlers are taking up homesteads along

the route, both north and south of the road. The progress made with the construction has not advanced as rapidly as could be desired. This is due to the impossibility of securing the requisite number of men for a vigorous prosecution of the work. In several instances many teams of horses were standing idle in the stables, owing to inability to secure teamsters to drive them. It is manifest that the supply of laboring men in Canada at the present time is insufficient to meet the demand, and is not within 40 to 50 per cent. of the number of men required to carry out the contracts in hand.

The following is a statement of the approximate quantities of work on the section between Portage la Prairie and Edmonton, and the amount of work executed thereon up to September 1, 1906:

Character of work.	Quantity of work—Total.	Done to Sept. 1, 1906.
Clearing, acres	1,420	1,409
Grubbing, acres	260	97
Earth excavation, cu. yds.	17,700,000	5,091,000
Rock excavation, cu. yds.	797,000	314,700
Culverts, lin. ft.	62,000	17,900
Large trestle bridges, lin. ft.	16,000	4,400
Smaller pile bridges, lin. ft.	11,000	2,060
Steel bridges over large rivers, lin. ft.	5,700	Nil.
Telegraph and telephone lines, miles	750	20,000 telegraph poles delivered.
Fencing	1,500	Nil.
Track complete, including ballasting, miles.	816	50,000 tons rails delivered; 160,000 ties delivered; 2 miles track laid.
Station and other buildings	265	Nil.
Cattle-guards and sign boards.	1,500	Nil.
Rip-rap, cu. yds.	20,000	200

The materials for the rest of the culverts, trestles and pile bridges, etc., can be taken out in the winter months, and delivered where it is to be used with much greater facility than in the summer. If nothing interferes track should be laid to Edmonton by the end of next autumn.

GREAT SOUTHERN.—This company, which last year built 30 miles of its line from The Dalles, Ore., to Tygh Valley, 52 miles, will build the remaining 22 miles with its own forces.

GREENSBURG & WESTERN (ELECTRIC).—See West Penn Ry.

GREENVILLE & NEWNAN.—See Central of Georgia.

GURDON & FORT SMITH NORTHERN RAILWAY.—See Missouri Pacific.

GURDON & FORT SMITH RAILROAD.—See Missouri Pacific.

HOBOKEN & MANHATTAN.—See Hudson & Manhattan.

HUDSON & MANHATTAN.—On December 5, 1906, the New York & Jersey (of New York), Hudson & Manhattan (of New York), and Hoboken & Manhattan (of New Jersey) were consolidated into one corporation, known as the Hudson & Manhattan Railroad Company, being a corporation of the states of New York and New Jersey.

Charles M. Jacobs, Chief Engineer, has made a report on the progress of the work on the tunnels. It shows that the tunnels of the Manhattan end now extend from the shaft near the foot of Christopher street nearly to the corner of Christopher street and Ninth avenue; that the two tubes from there to Hoboken are finished except for the operating tracks; that the tubes from Jersey City to Cortlandt and Fulton streets have been bored about three-quarters of the way across, and that the work on the tunnels for the Jersey connections of the under-river tubes is nearly half done. At the beginning of 1906 work on the project was being done from three shafts, while at the present time boring is done from 19 different points. In 1906 the number of men employed on the tunnels was increased from 1,350 to more than 5,000.

KANAWHA & WEST VIRGINIA.—Surveys are being made by this company for an extension of its road from Pond Gap, W. Va., to Sweet Springs, 140 miles.

LAKE ERIE & PITTSBURG.—Announcement has been made that work is to be started about April 1 on this new Vanderbilt line, building from Cleveland and Lorain to Youngstown, and that contracts for work will be let shortly.

LEWISTON & SOUTHEASTERN (ELECTRIC).—An officer writes that contracts have been let to Schofield & Co., of Philadelphia, for building this company's proposed line from Lewiston, Idaho, south via Westlake to Grangeville, with a branch from Westlake east to Ilo, and thence south to Nezperce, a total of 135 miles. Considerable grading has been finished, but no track has yet been laid. W. P. Wood, Chief Engineer, Lewiston, Idaho.

LONG ISLAND.—The work to be carried out this year by this company includes a second track from Roslyn to Glen Cove, from Flushing to Port Washington and from Flushing to Whitestone Landing; also from Oakdale to Patchogue. Third and fourth track from Winfield to Jamaica, and a double track connection from Glendale Junction on the Montauk division to White Pot on the main line, and third track from Hollis to Brushville.

LOUISIANA & ARKANSAS.—An officer writes that contracts have been let to M. Tansey, of Tiago, La., for extending the main line from Tiago south to Pineville, opposite the city of Alexandria, about five miles.

LOUISVILLE & GREAT WESTERN TRACTION.—Surveys have been made by this company, which is controlled by the Louisville & Northern Railway & Lighting Company, from New Albany, Ind., to French Lick, 53 miles, and from New Albany to Corydon an additional 20 miles. Grading is to be begun early in March. J. C. Henderson, New Albany, Chief Engineer.

LOUISIANA & NASHVILLE.—According to reports from Atlanta, Ga., this company is planning to build a 50-mile line connecting Chattanooga, Tenn., with the Atlanta-Knoxville division and Etowah, Tenn.

MANILA & SOUTH-WESTERN.—An officer writes that this company, which last year started building its proposed line from Wynn, Ark., northeast to Manila, 65 miles, has discontinued work on account of high water, and will resume building about May 1. D. A. Smith & Sons, of Manila, Ark., are the contractors. R. L. Williford, of Manila, President, and William E. Kerr, Jonesboro, Chief Engineer.

MIDDLETOWN & CECILTON.—This company is building a line from Middletown, Del., via Warwick, Md., to Cecilton, Fredericktown and Georgetown, Md., 12 miles. Contracts let to W. R. Polk, Middletown, Del., for building from the Maryland state line, about nine miles; 7½ miles graded, but no track laid. The company proposes to build a branch from Cecilton to Bayview, seven miles. It has not yet been decided whether gasolene or steam will be used as a motive power. W. R. Polk, General Manager.

MISSOURI PACIFIC.—This company, under the names of the Gurdon & Fort Smith Railroad, and Gurdon & Fort Smith Northern Railway, is building from a point half a mile east of Antoine, Ark., via Amity and Caddo Gap, to a point near Black Springs, 39½ miles. The grading has been finished and track has been laid from near Antoine to a point near Caddo Gap, 30 miles.

Contracts let to R. M. Bushman and to A. M. Hanson, of Springfield, Mo., for a two-mile extension of the Springfield Southwestern into Springfield, Mo.

MOREHEAD & NORTH FORK.—An officer writes that contracts have been given to the Snyder Construction Co. for building the proposed line from Morehead, Ky., to Paragon, ten miles. Sub-contracts have been let to the Rinehart-Dennis Company for building three miles, including a 1,400-ft. tunnel. Grading is completed and three miles of track laid. E. W. Hess, Chief Engineer, Clearfield, Pa.

NAUGATUCK VALLEY (ELECTRIC).—This company, which last year let contracts to C. W. Blakesley & Sons, of New Haven, Conn., to build from Naugatuck, Conn., via Bacon Falls to Seymour, eight miles, has track laid for five miles. The line is expected to be completed the coming summer, when it is to be turned over to the Consolidated Railway Company. Two other lines are being built, one from Waterbury to Woodbury, 13 miles, and the other from Thomaston to Waterbury, six miles. It is expected to complete these lines also during the coming summer.

NEBRASKA, KANSAS & SOUTHWESTERN.—Incorporated in Kansas, with $1,500,000 capital, to build a line from Superior, Nuckols County, Neb., to Moncton County, Kan. A. W. Wilson, H. C. Floyd, J. C. Hopper, C. H. Rassfield and R. D. McKinley, incorporators.

NEW YORK & JERSEY.—See Hudson & Manhattan.

NEW YORK, AUBURN & LANSING (ELECTRIC).—An officer writes that grading work has been finished by the Auburn Construction Co., of Auburn, N. Y., on this company's line from Auburn via Fleming, Scipio, Venice, Genoa and Lansing to Ithaca, 35 miles. Track has been laid from Auburn to Genoa, 20 miles.

OMAHA & NEBRASKA CENTRAL (ELECTRIC).—Local reports state that grading will begin as soon as frost is out of the ground on this proposed line from Omaha, Neb., to Hastings, 200 miles.

PADUCAH SOUTHERN.—Incorporated in Kentucky to build a line to be operated by steam and electric power from Paducah to Hickman, and eventually to East St. Louis, Ill. D. A. Archer is the promoter. B. H. Scott, H. H. Loving, W. A. Martin and B. Weille, of Paducah, are interested.

SACRAMENTO & VALLEJO.—Incorporated in California with $1,000,000 capital to build from Sacramento southwest to Vallejo, 60 miles. W. Knight and B. Pringle, of Sausalito, and William G. Barr, of San Francisco, are interested.

ST. MARY'S & WESTERN ONTARIO.—Bids are wanted by J. G. Macklin, Chief Engineer, St. Mary's, Ont., Feb. 20, for the clearing of right of way, grading, track-laying, bridging, ballasting, fencing and telegraph lines complete for a section of this line between St. Mary's and Embro, Ont. Rails, ties and fastenings will be supplied by the company.

SASKATCHEWAN VALLEY & HUDSON'S BAY.—A bill is before the Railway Committee to authorize the incorporation of this company,

which proposes to build a line from Edmonton, Alb., to Prince Albert, and thence to Fort Churchill on Hudson's Bay, 1,500 miles.

Seward Peninsular.—An officer writes that this company, organized last year to build a line from Nome, Alaska, to Kaugarok, 125 miles, is building from Nome to Lanes Landing, 69 miles. C. L. Morris, of Nome, is the contractor. The company proposes also to extend from Lanes Landing to Mines, 30 miles.

South Carolina Public Service Corporation.—This company has been incorporated in Georgia with $500,000 capital to build from Charleston, Ga., to Columbia, with extensions to Spartansburg and Charlotte, through Lexington, Saluda, Greenwood, Union and Newberry; also to build from Augusta via Aiken to Orangeburg. The company has projected a total of 525 miles of new lines. J. J. Timmes, President; C. R. Van Etten, Vice-President; J. P. Bonney, Secretary and Treasurer, all of New York. J. C. Lott, R. H. Jennings and J. A. Craig, of Orangeburg, and L. M. Pinckney, of Charleston, are interested.

South Wilmington & Southern.—Incorporated in Illinois with $25,000 capital and office at Chicago, to build a line from South Wilmington in Grundy County, south to Wilson, Livingston County. A. L. Sweet, W. Farmer, R. H. Gruschow, C. A. Sweet and T. A. Lemmon are directors and incorporators.

Springfield Southwestern.—See Missouri Pacific.

Toronto, Niagara & Western.—This company is planning to build a high speed electric line from Niagara Falls, Ont., to Toronto, over the right of way of the Toronto & Niagara Power Company, 90 miles; also to extend later to Brantford, Woodstock, Ingersoll, London, Paris and other points.

Waupaca & Green Bay.—Incorporated in Wisconsin with $100,000 capital to build from Waupaca northeast to Scandinavia, 11 miles. A. G. Nelson, A. M. Renney, W. B. Johnson, J. Gordon and A. A. Aggerbeck are interested.

West Point Railway (Electric).—Under the name of the Greensburg & Western, application will be made in Pennsylvania to built from Greensburg, Pa., west to Irwin, about 12 miles.

Yosemite Valley.—This company is building with its own men an extension from the present end of its track in California to the Yosemite National Park, 30 miles. Surveys also being made from Junction to Wanona, an additional 32 miles. N. C. Ray, Chief Engineer, Merced, California.

Youngstown & Ohio River (Electric).—This company, which is building from Salem, Ohio, via Washingtonville, Leetonia, Lisbon and West Point to East Liverpool, has let contracts for the first 16 miles from Washingtonville to West Point. Grading finished from Lisbon to Leetonia, eight miles. The work includes about 7,000 ft. of trestle. George L. Wells, Salem, Ohio, Chief Engineer.

RAILROAD CORPORATION NEWS.

Bay Shore Terminal (Electric).—This property has been sold to the Norfolk & Ocean View, which is presumably owned by the Norfolk & Portsmouth Traction. The latter company operates 155 miles of road in and about Norfolk, Va., and is controlled by E. B. Smith & Co., of Philadelphia. The Bay Shore Terminal was sold under foreclosure on May 3, 1906, to E. B. Smith & Co. for $765,000, but the sale has been contested in the courts until a recent decision was made allowing the sale as above.

Boston & Maine.—Gross earnings for the six months ended December 31, 1906, were $21,422,180, an increase of $1,042,298. Operating expenses show a still larger increase; they include $850,000 spent on new block signals and rolling stock, which is $270,000 more than was spent on this account during the corresponding period of 1905. The net earnings were $5,615,966, a decrease of $310,767.

Buffalo & Susquehanna.—This company, it is said, is planning the issue of $10,000,000 5 per cent. short term notes to pay for its recent extension to Blasdell, N. Y. (Feb. 8, p. 196.)

Canadian Pacific.—This company has sold in London something less than $7,500,000 4 per cent. non-cumulative preferred stock, making about $45,350,000 now outstanding. The charter of the company provides that the preferred stock shall never exceed one-half of the common stock; there is now $121,000,000 of the latter outstanding. The additional preferred stock was sold at 101½, which is the equivalent of 98⅜ in New York. The money will be held in the treasury until needed, as the company only sold the stock because of the high price bid for it.

Chartiers Railway.—A circular has been sent to stockholders of this company offering to exchange three shares of common stock of the Pittsburg, Cincinnati, Chicago & St. Louis, $100 par value, for each share of stock of the Chartiers Railway, par value $50. The Chartiers Railway is 23 miles long, running from Carnegie, Pa., to Washington, Pa. It is leased to the Pittsburg, Cincinnati, Chicago & St. Louis, and a majority of its $645,300 stock is owned by the Pennsylvania Company. Its stock pays 10 per cent. dividends, and the Pittsburg, Cincinnati, Chicago & St. Louis common pays 4 per cent.

Chicago Great Western.—This company is planning to sell $3,000,000 additional cumulative 4 per cent. debenture stock in London, the proceeds to pay for double tracking. There is now outstanding $26,127,000 debenture stock, being part of an authorized issue of $30,000,000.

Cleveland, Cincinnati, Chicago & St. Louis.—It is reported that plans are under way for an issue of not more than $10,000,000 notes. Three New York Central lines, the New York Central & Hudson River, the Lake Shore & Michigan Southern and the Michigan Central, recently issued, together, $50,000,000 three-year 5 per cent. notes.

Delaware & Hudson.—See Quebec, Montreal & Southern.

Evansville & Southern Indiana Traction.—This company has filed a mortgage securing an issue of $4,000,000 5 per cent. 30 year bonds; part of the proceeds are to be used to redeem bonds of the Evansville Electric, and the Evansville, Princeton & Vincennes, recently acquired. (Jan. 25, p. 129.)

Great Northern.—The approximate gross earnings for the month of January, 1907, were $2,546,526, a decrease of $1,101,135; this falling off in earnings was due to the exceptionally heavy snowfalls and high winds which have interfered with traffic.

Minneapolis, St. Paul & Sault Ste. Marie.—The severe storms in the northwest greatly affected the January earnings of this road. Gross earnings for the four weeks ended January 31 were $615,200, a decrease of $232,049, or 27 per cent. Gross earnings for the last week in January and the first week in February decreased 37 per cent.; the figures for the latter week are incomplete on account of snow blockade.

New York Central Lines.—Gross earnings for the month of January were as follows:

New York Central & Hudson River	$7,412,494	Inc.	$226,726
Lake Shore & Michigan Southern	3,464,616	Inc.	56,450
Lake Erie & Western	413,503	Dec.	42,662
Chicago, Indiana & Southern	245,428	Inc.	50,679
New York, Chicago & St. Louis	816,297	Dec.	51,178
Michigan Central	2,278,826	Inc.	199,085
Cleveland, Cincinnati, Chicago & St. Louis	1,828,801	Dec.	35,251
Peoria & Eastern	241,766	Dec.	20,861
Cincinnati Northern	74,190	Inc.	3,327
Pittsburg & Lake Erie	1,092,148	Dec.	23,536
Rutland	194,895	Dec.	2,961
Total	$18,062,974	Inc.	$359,818

New York, New Haven & Hartford.—Gross earnings for the three months ended December 31, 1906, were $14,027,310, an increase of $481,240; net earnings $5,050,309, an increase of $40,510.

Norfolk & Ocean View (Electric).—See Bay Shore Terminal.

Norfolk & Portsmouth Traction.—See Bay Shore Terminal.

Northern Central.—It is announced that the proposed merger of this road with the Pennsylvania, which controls it, has been abandoned. A shareholders committee was appointed three years ago to consider plans for a merger, the shareholders having at that time authorized a perpetual lease to or merger with the larger company. The committee has recommended that the directors be asked to make the next semi-annual dividend 5 per cent. on the $17,193,400 outstanding capital stock, and to continue this rate as long as the net income warrants such a disbursement. The annual rate has been 8 per cent. since 1901. A stock dividend of 12½ per cent. was declared last December.

Pennsylvania.—At the annual meeting of the stockholders on March 12, when they are to be asked to authorize $100,000,000 additional capital stock and $100,000,000 bonds, they will also be asked to give the Board of Directors authority to issue from time to time either stock or bonds as the occasion arises. (Jan. 18, p. 96.)

This company has leased from the recently organized Pennsylvania General Freight Equipment Trust 21,878 cars, being those ordered for 1906 delivery. Their cost was about $25,000,000. (Jan. 25, p. 130.)

See Northern Central; also Chartiers Railway.

Pittsburg, Cincinnati, Chicago & St. Louis.—See Chartiers Railway.

Quebec, Montreal & Southern.—This company, which is the holding company for the Delaware & Hudson's properties in Canada, has borrowed through the United States Mortgage & Trust Company $6,000,000 for one year at interest a little under 6 per cent. This loan is guaranteed by the D. & H. Of the proceeds, $1,750,000 is to pay for equipment already ordered, and the remainder is for construction.